

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

PMRA Submission Number {.....}

EPA MRID Number 51017506

Data Requirement: PMRA Data Code: 9.8.4 (TGAI) or 9.8.6 (EP)
EPA DP Barcode: N/A
OECD Data Point: IIA 8.12 (TGAI) and IIIA 10.8.1.1 (EP)
MRID: 51017506
EPA Guideline: 850.4150

Test material: Clarity® formulation (a.i. Dicamba DGA salt) Purity: 39.6% a.e. (w/w); 480 g/L
Roundup PowerMax® formulation (a.i. Glyphosate potassium salt) Purity: 39.74% a.e. (w/w);
540 g/L

Common name: Dicamba DGA and Glyphosate

Chemical name: IUPAC: 3,6-Dichloro-o-anisic acid-2-(2-aminoethoxy)ethanol (Dicamba DGA)
N-(phosphonomethyl)glycine (Glyphosate)
CAS name: 2-(2-Aminoethoxy)ethanol;3,6-dichloro-2-methoxy-benzoic acid (Dicamba DGA)
N-(phosphonomethyl)glycine (Glyphosate)
CAS No.: 104040-79-1 (Dicamba DGA salt)
70901-12-1 (Glyphosate potassium salt)

Synonyms: Diglycolamine salt of 3,6-dichloro-o-anisic acid

Primary Reviewer: Kindra Bozicevich
Senior Scientist, CDM/CSS-Dynamac JV

Kinsha Bozicevich
Signature: *Kinsha Bozicevich*
Date: 4/9/20

Secondary Reviewer: Terry Nelis
Senior Scientist, CDM/CSS-Dynamac JV

Terry Nelis
Signature: *Terry Nelis*
Date: 4/30/20

Primary Reviewer: Frank T. Farruggia, Ph.D.
Senior Scientist, EPA/OPP/EFED/ERB-1

Date: 5/26/2020 *Frank T. Farruggia* 2020.10.25
13:16:35 -04'00'

Secondary Reviewer(s): {.....}
(EPA/OECD/PMRA)

Date: {.....}

This Data Evaluation Record may have been altered by the Environmental Fate and Effects Division subsequent to signing by CDM/CSS-Dynamac JV personnel. The CDM/CSS-Dynamac Joint Venture role does not include establishing Agency policies.

Reference/Submission No.: {.....}

Company Code: {.....} [For PMRA]
Active Code: {.....} [For PMRA]
Use Site Category: {.....} [For PMRA]
EPA PC Code: 128931 (for Dicamba DGA salt)

Date Evaluation Completed: 26-05-2020

CITATION: Whitsel, J. 2020. Potential Effects of Clarity® + Roundup PowerMax® on Soybean Plants when Applied at Low Application Rates in the Field in Missouri. Unpublished study performed by MOARK Agricultural Research LLC, Fisk, Missouri; Eurofins EAG Agroscience, LLC, Columbia, Missouri; and Monsanto Company, Chesterfield, Missouri. Eurofins EAG Study No. 89431. Monsanto Study No.: MOA-2019-0256. Report No.: MSL0031007. Study sponsored by Monsanto Company, Chesterfield, Missouri. Study initiated July 16, 2019 and completed January 14, 2020.

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SUMMARY:

The effect of Clarity® formulation (a.i. Dicamba DGA salt) + Roundup PowerMax® formulation (a.i. Glyphosate potassium salt) + Adjuvant Intact™ on the vegetative vigor of dicot (dicamba non-tolerant/glyphosate-tolerant soybean, *Glycine max*; var. Beck's 4628FP) crops was studied in a soybean yield study. Nominal concentrations ranged from 0.00030 to 0.0048 lb ae dicamba/A and 0.000675 to 0.0108 lb ae glyphosate/A in the spray tank solution. The test concentrations of dicamba and glyphosate were analytically confirmed at all treatment levels, and nominal and measured application rates are provided in Table 3.

The growth medium used in the vegetative growth stage and reproductive stage tests were field soils located in Missouri (sand, pH and organic matter content not reported).

Two developmental growth stage application timings were assessed, early vegetative growth stage (V3) and flowering reproductive stage (R1). The treatment field was divided into two equal fields with 24 replicate plots for each test; non-dicamba tolerant soybeans were planted on July 14, 2019. The test solutions were applied to the respective field on August 8, 2019 and August 27, 2019 for the vegetative growth test and the reproductive test, respectively. On 28 days after treatment (DAT) for both experiments, soybean plants were measured for height and assessed for visual morphology. Soybean plants were harvested for determination of yield for both studies.

When compared to the negative control, significant inhibitions in soybean plant height were found for both the vegetative growth and reproductive stages. For the vegetative growth stage, significant inhibitions in soybean height were found at 0.0006 lb ae dicamba/A and 0.00135 lb ae glyphosate/A and higher. For the reproductive stage, significant inhibitions in soybean height were found at 0.0012 lb ae dicamba/A and 0.0027 lb ae glyphosate/A and higher.

When compared to the negative control, no significant inhibitions in soybean yield were found for either the vegetative growth stage exposure trial. For the reproduction stage exposure, the highest tested concentration had a significant reduction in yield as compared to the negative control.

Dry weight and survival were not tested in either of the two tests.

Based on the IC_{25s}, the most sensitive endpoint was day 28-height for the vegetative growth stage exposure, with NOAEC and IC₂₅ values of 0.00035 and 0.002 lb ae/A Dicamba, respectively (corresponding to a NOAEC and IC₂₅ of 0.00039 and 0.00171 lb ae/A glyphosate, respectively).

Reported visual signs of injury (VSI) included leaf cupping, epinasty of both stems and petioles, and some stunting and were readily apparent at all application rates in soybean plants in the vegetative growth study after 14 and 28 days. Two of the control plots showed 5% VSI on day 28. In the reproductive stage study, some new secondary stem growth was epinastic, some younger pods were curled, and there was compression of the main stem internodes. VSI was evaluated using logistic regression in Excel fit to observed VSI for each test dose. No hypothesis testing was evaluated to establish NOAEC/LOAEC endpoints. Regression equations provided in Figures 3 and 4 were used to estimate the %VSI for regression based ICx values for plant height and yield. Table 1b provides the observed (NOAECs) and estimated (ICx) average %VSI for each height and yield endpoint for 14DAT and 28DAT.

Maximum Labeled Rate: Not reported

Results Synopsis

A summary of the endpoints for height and yield are provided for dicamba (Table 1a) and glyphosate (Table 1c). Also provided in Figures 1a & 1b are the response relationships between height, VSI, yield, test concentration and evaluation time step. The average %VSI for each height and yield endpoint is provided in Table 1b. This study is

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scientifically sound and is classified as **supplemental**.

Table 1a. Summary of most sensitive parameters (lb ae/A Dicamba).

Species	Stage	Endpoint	NOAEC	EC ₀₅ /IC ₀₅	EC ₂₅ /IC ₂₅
Soybean	Vegetative Growth	14-DAT Height	0.00081	0.00034	0.0027
		28-DAT Height	0.00035	0.00010	0.0020
		Yield	0.0087	NC	NC
	Reproductive	14-DAT Height	0.0016	0.0016	0.0084
		28-DAT Height	0.00064	0.00057	0.0082
		Yield	0.0032	0.0016	0.0055

NC = Not calculable.

Table 1b. Summary of Estimated Average % VSI at Endpoint Concentrations provided in Table 1a. (%)

Species	Stage	Endpoint*	NOAEC	EC ₀₅ /IC ₀₅	EC ₂₅ /IC ₂₅
Soybean	Vegetative Growth	VSI 14-DAT Height	38	30	47
		VSI 28-DAT Height	20	13	34
		VSI Yield ^a	55 (14DAT) 45 (28DAT)	NC	NC
	Reproductive	VSI 14-DAT Height	23	25	42
		VSI 28-DAT Height	30	22	57
		VSI Yield	33 (14DAT) 45 (28DAT)	25 (14DAT) 35 (28DAT)	38 (14DAT) 52 (28DAT)

* Endpoints in Table 1a were used to a) provide the observed VSI at the NOAEC, and b) estimate the %VSI at height and yield IC_x endpoints using logistic regression equations fit to study reported VSI on 14-DAT and 28-DAT.

^a VSI was not assessed at the time of harvest, therefore %VSI for Yield is presented as the observed or predicted %VSI at 14DAT and 28DAT for the Yield endpoints in Table 1a.

Table 1c. Summary of Parameters (lb ae/A Glyphosate).

Species	Stage	Endpoint	NOAEC	EC ₀₅ /IC ₀₅	EC ₂₅ /IC ₂₅
Soybean	Vegetative Growth	VSI 14-DAT Height	0.00088	0.00038	0.0022
		VSI 28-DAT Height	0.00039	0.00013	0.0017
		VSI Yield	0.0059	NC	NC
	Reproductive	VSI 14-DAT Height	0.002	0.0017	0.018
		VSI 28-DAT Height	0.0009	0.00053	0.0163
		VSI Yield	0.0086	0.00157	0.0103

NC = Not calculable.

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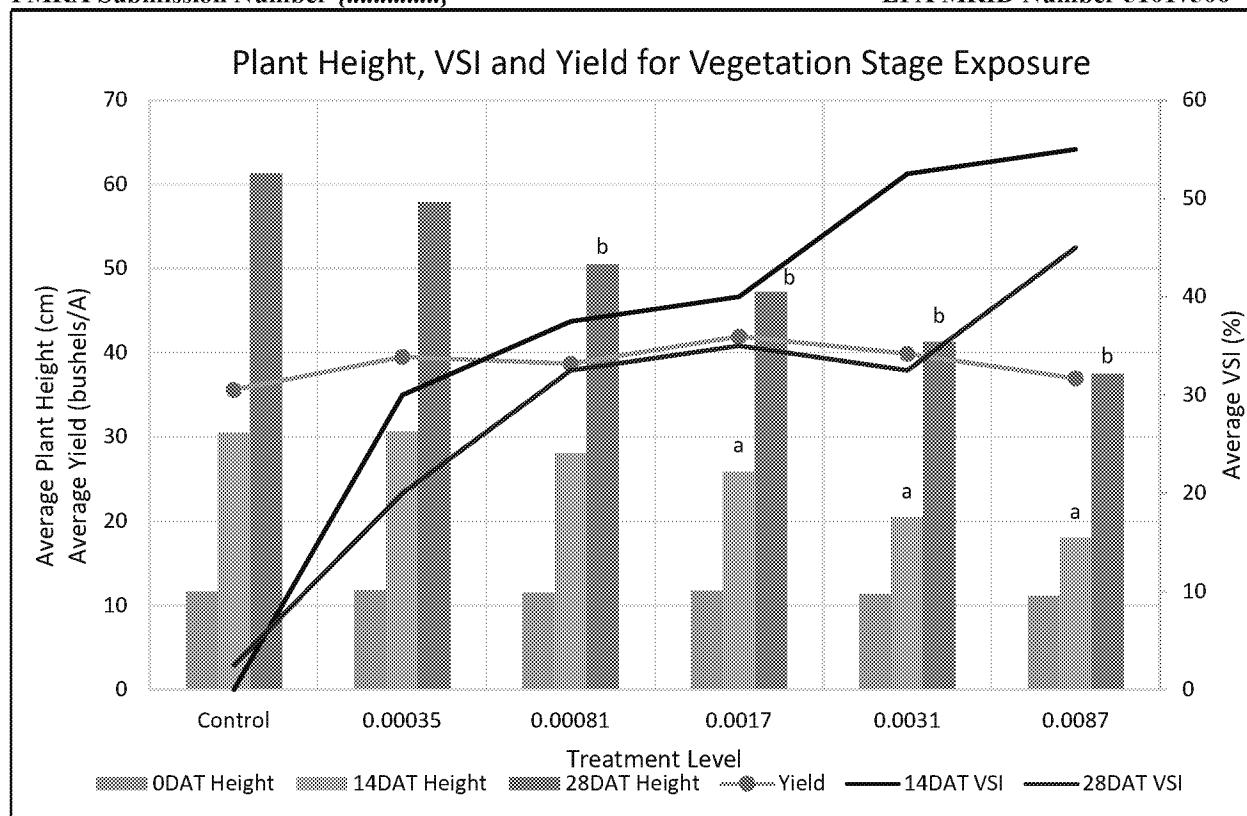


Figure 1: Relationship of plant height (Day 0, 14, 28), VSI (Day 14, 28) and yield (test termination) for the treatments applied during vegetative growth stages. Note: treatment levels with responses determined to be statistically different from the controls for day 14 height ("a"); day 28 height ("b"), and yield ("c") are indicated.

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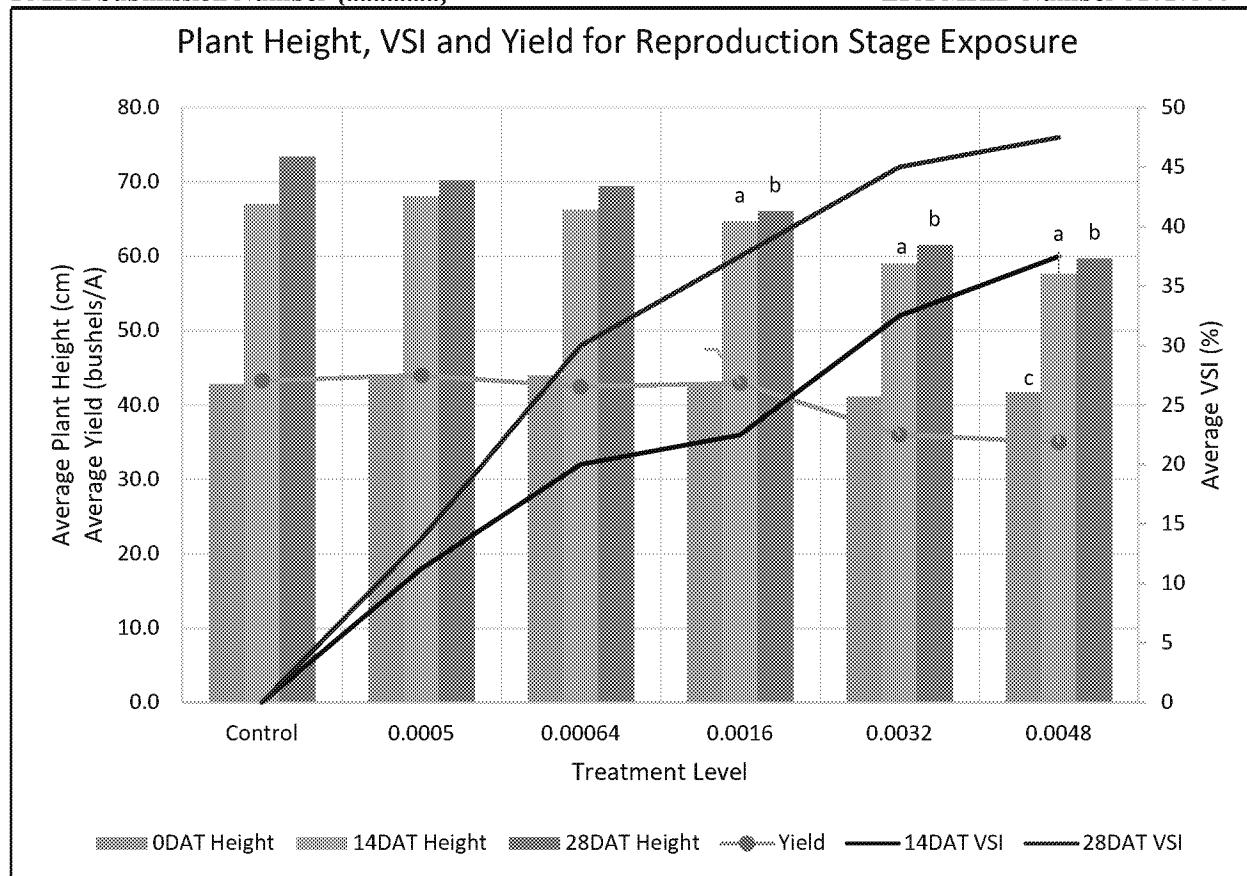


Figure 2: Relationship of plant height (Day 0, 14, 28), VSI (Day 14, 28) and yield (test termination) for the treatments applied during reproductive growth stages. Note: treatment levels with responses determined to be statistically different from the controls for day 14 height ("a"); day 28 height ("b"), and yield ("c") are indicated.

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED:

This study was a non-guideline yield study. The reviewer evaluated the study methods according to OCSPP Guideline 850.4150: Vegetative Vigor. The following deviations were noted by the reviewer:

- For both the vegetative growth and reproductive portions of the study, the study author measured the height of five plants "selected non-systematically" within each row of the two center rows in each replicate plot for a total of 10 plants prior to treatment, 14 DAT and 28 DAT (p. 18).

OCSPP guidance recommends that the integrity of the replicate should be maintained throughout the duration of the study. In this study, plant height was determined for ten different plants at each measurement. The reviewer suggests that this sampling method is inadequate and introduces unnecessary variability into the study results that should have been more systematically controlled.

- Control plots were located so that "no control plot was allowed to be adjacent to a plot receiving the

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highest application rate" (p. 16). The study authors assume there is no potential for drift to the control plots from the other lower applications.

Likewise, the vegetative growth test field and the reproductive test fields were adjacent and separated by at least 20 ft (6 m). The wind was from the north with a speed of 1-5 mph for the reproductive stage (Table 5, p. 28). The study authors assume there is no potential for drift to the vegetative growth plots from the reproductive study spray application on August 27, 2019.

3. 2 of 4 control plots in the vegetative exposure study had 5% VSI suggesting dicamba exposure from some unknown source.
4. The study author did not report inhibitions for height and yield data for the vegetative growth or reproductive study.
5. Survival of plants in each test plot was not determined. OCSPP guidance recommends measuring effects on survival as part of the vegetative vigor test. Dry weight of plants in each test plot was also not determined. OCSPP guidance recommends measuring effects on plant biomass as part of the vegetative vigor test.
6. "The soybean experiments were harvested at a single time, based on the maturity of plants in the control plots within each experiment" (p. 19). The maturity of the soybean crop at time of harvest was not reported or described.
7. Soybean was the only species tested. OCSPP guidance recommends testing 4 monocots and 6 dicots.
8. No supplemental irrigation was applied during the study.
9. The following soil property details were not reported: depth of soil collection, percent sand, silt and clay, pH, percent organic carbon, CEC and moisture at 1/3 atm.
10. The study author did not provide seed supplier information and historical germination rates for the soybean varieties planted.
11. Light intensity and humidity at the field test site were not determined. Daily observations of any moisture stress were also not reported.
12. The recovery of Dicamba in tank solution samples was higher than the recommended recovery range of 70-120% for most of the tank samples (7 out of 10 were higher, ranging from 127-178%). The recovery of Glyphosate in tank solution samples was lower than the recovery range of 70-120% for most of the tank samples (7 out of 10 were lower, ranging from 43-68%). No reason was provided for the recoveries outside the acceptable range.
13. Limits of detection (LOD) were not reported for HPLC-UV analysis.
14. The physico-chemical properties of the test materials were not reported.
15. The Beck's 4628FP variety of soybean that was planted in the test plots for both the vegetative growth and reproductive study, is a non-Dicamba tolerant soybean. This variety was also selected because of its glyphosate-tolerance. It is uncertain if this genetically modified variety may have impacted dicamba effects compared to a non-genetically modified variety.

The deficiency and deviations did have an impact on the acceptability of this study.

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COMPLIANCE: Signed and dated Good Laboratory Practices (GLP), Quality Assurance, and No Data Confidentiality statements were provided. This study was conducted in compliance with U.S. EPA 40 CFR Part 160 with the following exceptions: GPS coordinates, planting, weather data, pesticide history, soil characterization, maintenance practices, and equipment used for harvest.

A. MATERIALS:

1. Test Material: Clarity® formulation (a.i. Dicamba DGA salt)
Roundup PowerMax® formulation (a.i. Glyphosate potassium salt)
Intact drift reduction agent (<0.005% (v/v))

Description: Not reported

Lot No./Batch No.: Not reported

Purity: 39.6% (w/w); 480 g/L (Dicamba)
39.74% (w/w); 540 g/L (Glyphosate)

Stability of compound under test conditions: Measured concentration of the test material in the tank mix yielded recoveries of 99-178% (n = 10) for dicamba DGA and 43-80% (n = 10) for glyphosate acid. Reasons for the recoveries being outside the acceptable recovery range were not reported. Stability was not determined.
(OECD recommends chemical stability in water and light)

Storage conditions of test chemicals: Not reported

Table 2. Physical/chemical properties of Clarity® formulation (a.i. Dicamba DGA salt) + Roundup PowerMax® formulation (a.i. Glyphosate potassium salt)

Parameter	Values	Comments
Water solubility at 20°C	Not reported	
Vapor pressure	Not reported	
UV absorption	Not reported	
pKa	Not reported	
Kow	Not reported	

2. Test organism:

Monocotyledonous species: None.

EPA recommends four monocots in two families, including corn.

Dicotyledonous species: Soybean (*Glycine max*, Fabaceae; var. Beck's 4628FP (Dicamba-non-tolerant and glyphosate-tolerant soybeans))

EPA recommends six dicots in four families, including soybean and a root crop.

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OECD recommends a minimum of three species selected for testing, at least one from each of the following categories: Category 1: ryegrass, rice, oat, wheat, and sorghum; Category 2: mustard, rape, radish, turnip, and Chinese cabbage; Category 3: vetch, mung bean, red clover, fenugreek, lettuce, and cress.

Seed source: Not reported

Prior plant treatment/sterilization: Not reported

Historical % germination of seed: Not reported

Seed storage, if any: Not reported

B. STUDY DESIGN:

1. Experimental Conditions

a. Limit test: None.

b. Range-finding study: None.

c. Definitive Study

Table 3. Nominal and Analytically Confirmed Test Application Rates (lb ae/A) for Soybean.¹

Nominal Rates		Analytically Confirmed Rates of Dicamba Adjusted for Measured Field Application Rates ² (Percent of Nominal)	Analytically Confirmed Rates of Glyphosate Adjusted for Measured Field Application Rates ² (Percent of Nominal)
as Dicamba	as Glyphosate	Vegetative Growth Stage	
0 (negative control)	0 (negative control)	<0.00034 (<LOQ)	<0.00067 (<LOQ)
0.0003	0.000675	0.00035 (115)	0.00039 (57 ³)
0.0006	0.00135	0.00081 (131 ³)	0.00088 (66 ³)
0.0012	0.0027	0.0017 (138 ³)	0.0012 (43 ³)
0.0024	0.0054	0.0031 (127 ³)	0.0028 (53 ³)
0.0048	0.0108	0.0087 (178 ³)	0.0059 (54 ³)
		Reproductive Growth Stage	
0 (negative control)	0 (negative control)	<0.00034 (<LOQ)	<0.00067 (<LOQ)
0.0003	0.000675	0.00050 (171 ³)	0.00035 (52 ³)
0.0006	0.00135	0.00064 (105)	0.00090 (68 ³)
0.0012	0.0027	0.0016 (133 ³)	0.0020 (74)
0.0024	0.0054	0.0032 (129 ³)	0.0042 (77)
0.0048	0.0108	0.0048 (99)	0.0086 (80)

Data obtained from Table 1, p. 26 and Tables 8-9, pp. 33-34 in the study report.

¹ Treatments were tank-mixes of dicamba (Clarity®), glyphosate (Roundup PowerMax®), and Intact™, a drift reduction agent. Measured tank-mix concentrations for dicamba were 115.3-177.8% and 98.7-170.7% of nominal concentrations for the vegetative and reproductive experiments, respectively. Glyphosate concentrations were 42.6-65.7% and 51.7-80.3% of nominal concentrations for the vegetative and reproductive experiments, respectively (Table 7, p. 32).

² Measured tank concentrations were adjusted for measured field application rates (% of target GPA), and recoveries shown are based on analytical recoveries and field application rate recoveries and are rounded rates (DER Attachment 1).

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³ Recoveries were outside the acceptable range of 70-120%; the analytical report (Appendix 2, pp. 53-116) did not provide a reason for the recoveries outside the acceptable range.

Table 4: Experimental Parameters – Soybean Yield.

Parameters	Soybean Yield	
	Details	Remarks
		Criteria
Duration of the test	28 days for each experiment	<p>Plants were exposed at two different growth stages: early vegetative (V3) and reproductive at flowering (R1).</p> <p><i>Recommended test duration is 14-21 days.</i></p> <p><i>OECD recommends that the test be terminated no sooner than 14 days after 50 percent of the control seedlings have emerged</i></p>
Number of seeds/plants/species/replicate	10 plants/replicate	<p>Soybeans were planted on 30-inch row spacing and 1.5-inch plant spacing.</p> <p><i>Ten seeds per replicate should be used.</i></p> <p><i>OECD recommends a minimum of five seeds planted in each replicate within 24 hours of incorporation of the test substance. All seeds of each species for each test should be of the same size class. The seed should not be imbibed.</i></p>
Number of plants retained after thinning	Thinning not reported.	
<u>Number of replicates</u> Control: Adjuvant control: Treated:	4 N/A 4	<p><i>Four replicates per dose should be used.</i></p> <p><i>OECD recommends a minimum of four replicates per treatment</i></p>
Number of test concentrations:	Five low dose tank-mix application (Treatments 1-5) and one negative control (Treatment 0; tank-mix water)	<p>Stock solutions (1:100 dilutions) of Clarity®, Roundup PowerMax®, and Intact™ were prepared and used to individually mix each treatment.</p> <p><i>Five test concentrations should be used with a dose range of 2X or 3X progression</i></p> <p><i>OECD recommends three concentrations, preferably with application rates equivalent to 0.0 (control), 1.0, 10.0 and 100 mg substance per kg of oven-dried soil.</i></p>

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<u>Method and interval of analytical verification</u>	Tank-mix samples were collected and analyzed using HPLC with UV detection for dicamba DGA (220 nm) and glyphosate (500 nm).	
LOQ:	0.00034 lb ae/A (dicamba)	
LOD:	0.00067 lb ae/A (glyphosate) Not reported	
Adjuvant (type, percentage, if used)	Intact™ (Polyethylene glycol, choline chloride, guar gum), 0.5% v/v; (<0.005% v/v in the formulation)	
<u>Test container (plot)</u>		
Size/Volume:	Each treatment area was arranged as a randomized complete block (RCB) design. Each plot had 12 rows, with row spacing of 30 inches and row length of 20 ft. The center four rows were treated, for a total treated area of 200 ft ² .	Alleys between replicates (20 ft wide) were continuously planted with soybeans. Soybean borders (20 ft) surrounded both experimental plots. No control plot was allowed to be adjacent to a plot receiving the highest application rate.
Material: (glass/polystyrene)	Not applicable	<i>Non-porous containers should be used.</i> <i>OECD recommends that non-porous plastic or glazed pot be used.</i>
Growth facility	Soybean field located in Sikeston, Missouri	
Method/depth of seeding	Soybeans were planted on July 14, 2019 for both experiments. The method of planting was not reported.	Prior to planting, a proper seedbed was prepared according to local agronomic practices, including tillage and herbicide applications.
<u>Test material application</u> Application time including the plant growth stage	Early vegetative growth stage: V3 Flowering reproductive stage: R1	Applies dates were 8/8/2019 for the vegetative growth stage and 8/27/2019 for the reproductive stage.
Number of applications	Single application, applied in 1 pass	
Application interval	N/A- single application for each experiment	
Method of application	The test material was applied using a backpack sprayer (CO ₂ propellant) with six Greenleaf Airmix® nozzles spaced 20.1 inches apart. Treatments were	

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	applied with a boom height of 18 inches and travel speed of 2.54 mph (vegetative stage) and 2.35 mph (reproductive stage). The target application rate for each experiment was 10-20 gallons per acre (GPA).	
<u>Details of soil used</u> Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: % organic carbon CEC (meq/100g) Moisture at 1/3 atm (%)	Sikeston, Missouri Not applicable Sand Not reported Not reported Not reported Not reported Not reported Not reported Not reported	Previous crop: Soybean <i>Soil mixes containing sandy loam, loam, or clay loam soil with no greater than 2% organic matter are preferable. Glass beads, rock wool, and 100% acid washed sand are not preferred.</i> <i>OECD prefers the soil to be sieved (0.5 cm) to remove coarse fragments. Carbon content should not exceed 1.5% (3% organic matter). Fine particles (under 20um) makeup should be between 10 and 20%. The recommended pH is between 5.0 and 7.5.</i>
Details of nutrient medium, if used	Not applicable	
<u>Watering regime and schedules</u> Water source/type: Volume applied: Interval of application: Method of application:	None Not applicable Not applicable Not applicable	Rainfall during the yield study was not reported. The reviewer obtained partial rainfall data for the reproductive stage from MRID 51017503 (Table 11, pp. 122-123) where rainfall was collected from 9/10/19 to 10/9/19. According to this data, cumulative precipitation from 9/10/19 to the approximate end of the 28-day reproductive stage (<i>ca.</i> 9/24/19) was 0.04 inches. See Reviewer's Comments for further details. <i>EPA prefers that bottom watering be utilized for seedling emergence studies so that the chemical is not leached out of the soil during the test.</i>
Any pest control method/fertilization, if used	None reported	
<u>Test conditions</u> Temperature (air): Temperature (soil at 2 in): Temperature (soil at 4 in):	Vegetative growth stage: 87.0°F Reproductive stage: 82.0°F Vegetative growth stage: 92.0°F Reproductive stage: 82.0°F Vegetative growth stage: 86.0°F Reproductive stage: 80.0°F	Only mean temperature and relative humidity data were reported. The reviewer was able to obtain partial ranges for temperature and relative humidity for the reproductive stage from MRID 51017503 (Tables 10-11, pp. 120-123). According to this data, ranges were the following: Temperature (air): Reproductive stage: 49.3-98.2°F

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Photoperiod:	Not applicable; the study was conducted outside.	Temperature (soil at 2 in): Reproductive stage: 75.9-92.5°F
Light intensity and quality:	Not measured	Relative humidity: Reproductive stage: 32-98%
Relative humidity:	Vegetative growth stage: 69% Reproductive stage: 72%	See Reviewer's Comments for further details. 100% cloud cover for vegetative growth stage and 80% cloud cover for reproductive stage.
		<i>EPA prefers that the cold vs warm loving plants be tested in two separate groups to optimize plant growth.</i> <i>OECD prefers that the temperature, humidity and light conditions be suitable for maintaining normal growth of each species for the test period.</i>
Reference chemical (if used) Name: Concentrations: Other parameters, if any	N/A	
Other parameters, if any	None	

2. Observations:

Table 5: Observation Parameters – Soybean Yield.

Parameters	Vegetative Vigor	
	Details	Remarks
Parameters measured (e.g., number of germinated seeds, emerged seedlings, plant height, fresh weight or other endpoints)	Plant height Yield Visual Morphology	
Measurement technique for each parameter	Plant height was measured for 10 non-systematically selected plants from the 2 center rows in the treated areas of each plot. Plant height was measured from the soil surface to the tip of the newest emerging apical bud (leaf) of the main stem. Morphology was visually determined as an aggregate across all plants within the center two treated rows of each plot.	Plots were harvested using a combine.

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	Yield was calculated based on the actual weight of soybeans harvested from two rows (107.5 ft ²) and the measured moisture content of the harvested soybeans.	
Observation intervals	Plant height and visual morphology were assessed for each treatment on the day of treatment (Day 0), or up to one day before treatment (Day -1), and at Days 14 and 28.	
Other observations, if any	N/A	
Were raw data included?	Yes	
Phytotoxicity rating system, if used	0-5 no effect; 10-30 slight effect; 40-60 moderate effect; 70-90 severe effect; 100- complete effect (dead plant)	

II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

Survival during the study was not determined by the study author and therefore could not be analyzed by the reviewer (Tables 6a and 6b).

Table 6a: Percent Inhibition of Survival- Vegetative Growth Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	ND
0.0006	0.00135	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.0108	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00035, 0.00081, 0.0017, 0.0031, and 0.0087 lb ae/A.

³ The measured, adjusted for field application rates were 0.00039, 0.00088, 0.0012, 0.0028, and 0.0059 lb ae/A.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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Table 6b: Percent Inhibition of Survival - Reproductive Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	ND
0.0006	0.00135	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.0108	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00050, 0.00064, 0.0016, 0.0032, and 0.0048 lb ae/A.

³ The measured, adjusted for field application rates were 0.00035, 0.00090, 0.0020, 0.0042, and 0.0086 lb ae/A.

When compared to the negative control, the reviewer found significant inhibitions in soybean plant height for both the vegetative growth and reproductive stages (Tables 6c and 6d). For the vegetative growth stage, significant inhibitions in soybean height were found at 0.0006 lb ae dicamba/A and 0.00135 lb ae glyphosate/A and higher, compared to the negative control (Williams Multiple Comparison test, p<0.05). For the reproductive stage, significant inhibitions in soybean height were found at 0.0012 lb ae dicamba/A and 0.0027 lb ae glyphosate/A and higher, compared to the negative control (Williams Multiple Comparison test, p<0.05).

The study author did not report inhibitions in height, but provided qualitative results identifying treatment levels with significant inhibitions. Study author results for height for the vegetative study were in agreement with reviewer results. The study author found significant inhibitions in soybean height for the reproductive stage at the highest treatment level only (0.0048 lb ae dicamba/A and 0.0108 lb ae glyphosate/A; overall F-test, $\alpha=0.05$), whereas the reviewer found significant inhibitions at 0.0012 lb ae dicamba/A and 0.0027 lb ae glyphosate/A and higher.

Table 6c: Percent Inhibition of Plant Height- Vegetative Growth Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	6
0.0006	0.00135	18*
0.0012	0.0027	23*
0.0024	0.0054	33*
0.0048	0.0108	39*

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00035, 0.00081, 0.0017, 0.0031, and 0.0087 lb ae/A.

³ The measured, adjusted for field application rates were 0.00039, 0.00088, 0.0012, 0.0028, and 0.0059 lb ae/A.

* Statistically significant when compared to the negative control.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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Table 6d: Percent Inhibition of Plant Height- Reproductive Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	4
0.0006	0.00135	5
0.0012	0.0027	10 ^{4*}
0.0024	0.0054	16 ^{4*}
0.0048	0.0108	19*

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00050, 0.00064, 0.0016, 0.0032, and 0.0048 lb ae/A.

³ The measured, adjusted for field application rates were 0.00035, 0.00090, 0.0020, 0.0042, and 0.0086 lb ae/A.

⁴ The study author did not consider percent inhibitions at these treatment levels as statistically significant.

* Statistically significant when compared to the negative control.

When compared to the negative control, the reviewer found no significant inhibitions in soybean yield for either the vegetative growth or reproductive stages (Tables 6e and 6f). Results reported by the study author were in agreement with the reviewer.

Table 6e: Percent Inhibition of Plant Yield- Vegetative Growth Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	-11
0.0006	0.00135	-9
0.0012	0.0027	-18
0.0024	0.0054	-12
0.0048	0.0108	-4

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00035, 0.00081, 0.0017, 0.0031, and 0.0087 lb ae/A.

³ The measured, adjusted for field application rates were 0.00039, 0.00088, 0.0012, 0.0028, and 0.0059 lb ae/A.

Table 6f: Percent Inhibition of Plant Yield- Reproductive Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	-2
0.0006	0.00135	2
0.0012	0.0027	1
0.0024	0.0054	17
0.0048	0.0108	19

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00050, 0.00064, 0.0016, 0.0032, and 0.0048 lb ae/A.

³ The measured, adjusted for field application rates were 0.00035, 0.00090, 0.0020, 0.0042, and 0.0086 lb ae/A.

Dry weight during the study was not determined by the study author and therefore could not be analyzed by the reviewer (Tables 6g and 6h).

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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Table 6g: Percent Inhibition of Dry Weight - Vegetative Growth Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	ND
0.0006	0.00135	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.0108	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00035, 0.00081, 0.0017, 0.0031, and 0.0087 lb ae/A.

³ The measured, adjusted for field application rates were 0.00039, 0.00088, 0.0012, 0.0028, and 0.0059 lb ae/A.

Table 6h: Percent Inhibition of Dry Weight - Reproductive Stage.

Nominal Rate lb ae/A		Percent Inhibition ¹
Clarity® (a.i. Dicamba) ²	Roundup PowerMax® (a.i. Glyphosate) ³	Soybean
0.0003	0.000675	ND
0.0006	0.00135	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.0108	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

¹ Treatment groups compared to the negative control.

² The measured, adjusted for field application rates were 0.00050, 0.00064, 0.0016, 0.0032, and 0.0048 lb ae/A.

³ The measured, adjusted for field application rates were 0.00035, 0.00090, 0.0020, 0.0042, and 0.0086 lb ae/A.

The most sensitive dicot was soybean, based on height in the vegetative growth stage, with NOAEC and IC₂₅ values of 0.00035 and 0.002 lb ae/A Dicamba, respectively (corresponding to a NOAEC and IC₂₅ of 0.00039 and 0.00171 lb ae/A glyphosate, respectively). The IC₀₅, IC₅₀, and/or corresponding 95% confidence interval were outside of the range of tested concentrations; therefore, these soybean results should be interpreted with caution.

The phytotoxic symptoms noted included leaf cupping, epinasty of both stems and petioles, and some stunting and were readily apparent at all application rates in soybean plants in the vegetative growth study after 28 days. In the reproductive stage study on Day 28, some new secondary stem growth was epinastic, some younger pods were curled, and there was compression of the main stem internodes. Phytotoxic symptoms were moderate and showed a dose-dependent response in both studies.

B. REPORTED STATISTICS:

For each experiment, ANOVA was conducted separately for each variable and time-point according to a randomized complete block design using SAS®. Comparisons of each treatment to the water-only control were defined within the ANOVA and tested using Dunnett's test. A two-parameter logistic model was used to estimate an EC₂₅ and an EC₅₀ for plant height and yield.

Data Evaluation Record on the Toxicity of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) to Terrestrial Vascular Plants: Soybean Yield

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Table 7a: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Vegetative Growth Stage.

Species	Results summary for height (lb ae/A Dicamba)									
	height (cm)	NOAEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	slope	95%CI
Soybean	37.53-61.33	0.0003	ND	N/A	0.0015	ND	0.0083	ND	N/A	N/A

ND- Not determined. N/A- Not applicable.

Table 7b: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield - Reproductive Stage.

Species	Results summary for height (lb ae/A Dicamba)									
	height (cm)	NOAEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	slope	95% CI
Soybean	59.70-73.40	0.0024	ND	N/A	0.0080	ND	0.0510	ND	N/A	N/A

ND- Not determined. N/A- Not applicable.

Table 7c: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield - Vegetative Growth Stage.

Species	Results summary for yield (lb ae/A Dicamba)									
	yield (kg/ha)	NOAEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	slope	95% CI
Soybean	2354-2959	0.0048	ND	N/A	NE	ND	NE	ND	N/A	N/A

ND- Not determined. N/A- Not applicable. NE- Not estimated due to poor model fit.

Table 7d: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield - Reproductive Stage.

Species	Results summary for yield (lb ae/A Dicamba)									
	yield (kg/ha)	NOAEC	EC ₀₅	95% CI	EC ₂₅	95% CI	EC ₅₀	95% CI	slope	95% CI
Soybean	2395-2822	0.0048	ND	N/A	0.0058	ND	0.0152	ND	N/A	N/A

ND- Not determined. N/A- Not applicable.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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28-Day Mean Visual Injury Rating

Nominal Rate lb ae/A		Vegetative Growth Stage (%)	Reproductive Stage (%)
Clarity® (a.i. Dicamba DGA) ¹	Roundup PowerMax® (a.i. Glyphosate acid) ²		
0 (negative control)	0 (negative control)	2.5	0.0
0.0003	0.000675	20.0*	13.8*
0.0006	0.00135	32.5*	30.0*
0.0012	0.0027	35.0*	37.5*
0.0024	0.0054	32.5*	45.0*
0.0048	0.0108	45.0*	47.5*

¹ The measured, adjusted for field application rates were 0.00035, 0.00081, 0.0017, 0.0031, and 0.0087 lb ae dicamba/A and 0.00039, 0.00088, 0.0012, 0.0028, and 0.0059 lb ae glyphosate/A for the vegetative growth stage.

² The measured, adjusted for field application rates were 0.00050, 0.00064, 0.0016, 0.0032, and 0.0048 lb ae dicamba/A and 0.00035, 0.00090, 0.0020, 0.0042, and 0.0086 lb ae glyphosate/A for the reproductive stage.

* Reported by the study author to be significantly different from the control.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

All analyses were conducted comparing treated to the negative control. These analyses were conducted using CETIS version 1.9.6.12 with database backend settings implemented by EFED on 7/25/2017. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests, and data that did not satisfy these assumptions were subjected to the non-parametric Mann-Whitney U and Jonckheere's tests. Linear (survival) and nonlinear (height and weight (yield)) regression models were used to interpret EC/IC_x values. Measured concentrations, adjusted for field application rates, were used for all statistical analyses. The results of 28DAT Plant Height, Yield and %VSI are provided in the tables below. The complete statistics evaluation and 14DAT results are provided in the CETIS output pages at the back of this DER.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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Table 8a: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Plant Height- Vegetative Growth Stage Exposure.

Results summary for height (lb ae/A Dicamba)									
height (cm)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
37.5-61.3	0.00035	0.0000996	6.73E-06-0.000275	0.002	0.00143-0.00274	0.0162	0.00859-0.0304	N/A	N/A
Results summary for height (lb ae/A Glyphosate)									
height (cm)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
37.5-61.3	0.00039	0.000132	1.44E-05-0.000312	0.00171	0.00129-0.00223	0.0102	0.006-0.0173	N/A	N/A

N/A- Not applicable.

*Endpoints and/or confidence intervals are outside tested range of concentrations and should be interpreted with caution.

Table 8b: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Vegetative Growth Stage.

Results summary for yield (lb ae/A Dicamba)									
Yield (kb/ha)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
2400-2820	0.0087	NC	N/A	NC	N/A	NC	N/A	N/A	N/A
Results summary for yield (lb ae/A Glyphosate)									
yield (kg/ha)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
2400-2820	0.0059	>0.0059	N/A	>0.0059	N/A	>0.0059	N/A	N/A	N/A

N/A- Not applicable.

*Endpoints and/or confidence intervals are outside tested range of concentrations and should be interpreted with caution.

Data Evaluation Record on the Toxicity of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) to Terrestrial Vascular Plants: Soybean Yield

PMRA Submission Number {.....}

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Table 9a: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Plant Height- Reproductive Stage.

Results summary for height (lb ae/A Dicamba)									
height (cm)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
59.7-73.4	0.00064	0.000565	8.29E-05-0.00132	0.00823	0.00317-0.0178	0.053	0.00489-0.574	N/A	N/A
Results summary for height (lb ae/A Glyphosate)									
height (cm)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
59.7-73.4	0.0009	0.00053	4.29E-05-0.00158	0.0163	0.00467-0.0445	0.176	0.00804-3.87	N/A	N/A

N/A- Not applicable.

*Endpoints and/or confidence intervals are outside tested range of concentrations and should be interpreted with caution.

Table 9b: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Reproductive Stage.

Results summary for yield (lb ae/A Dicamba)									
yield (kg/ha)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
2350-2960	0.0048	0.00159	N/A-0.00338	0.00554	0.00235-0.00985	NC	N/A	N/A	N/A
Results summary for yield (lb ae/A Glyphosate)									
yield (kg/ha)	NOAEC	IC ₀₅	95% CI	IC ₂₅	95% CI	IC ₅₀	95% CI	slope	95% CI
2350-2960	0.0086	0.00157	N/A-0.00427	0.0103	0.00313-0.0235	NC	N/A	N/A	N/A

N/A- Not applicable. NC = Not calculable.

*Endpoints and/or confidence intervals are outside tested range of concentrations and should be interpreted with caution.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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Evaluation of Visual Signs of Injury (%VSI)

VSI was evaluated using logistic regression in Excel fit to observed VSI for each test dose. No hypothesis testing was evaluated to establish NOAEC/LOAEC endpoints. Regression equations provided in Figures 3 and 4 were used to estimate the %VSI for regression based IC_x values for plant height and yield. See Table 1b in the executive summary for the results of these estimation procedures.

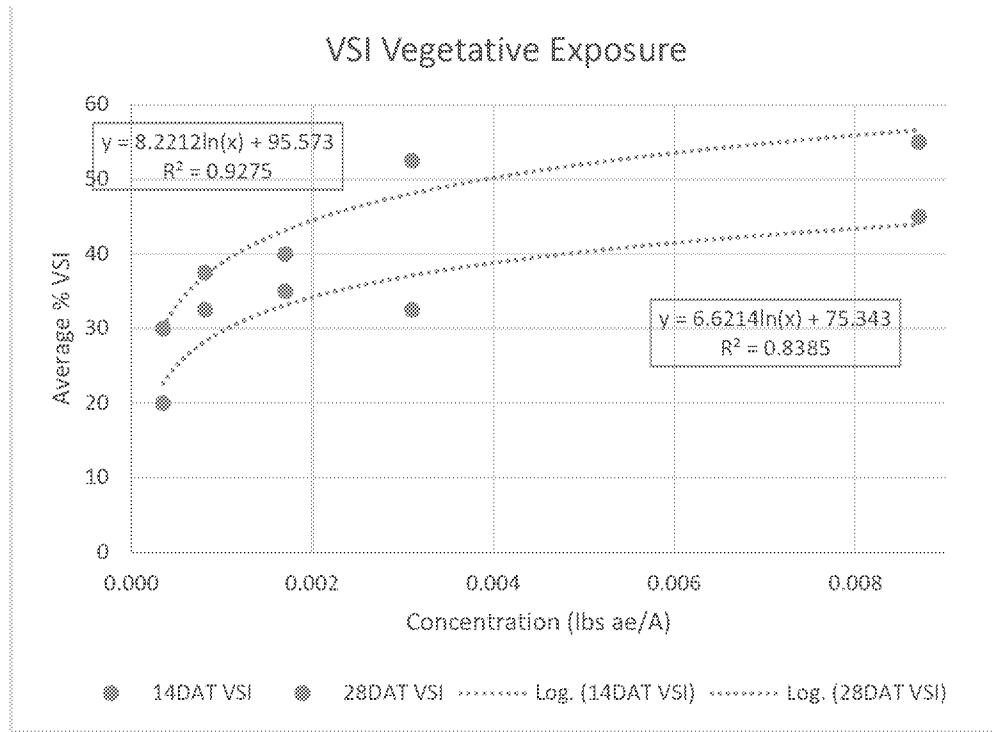


Figure 3. Logistic regression of %VSI for 14DAT and 28DAT observations of %VSI after a vegetative growth stage exposure.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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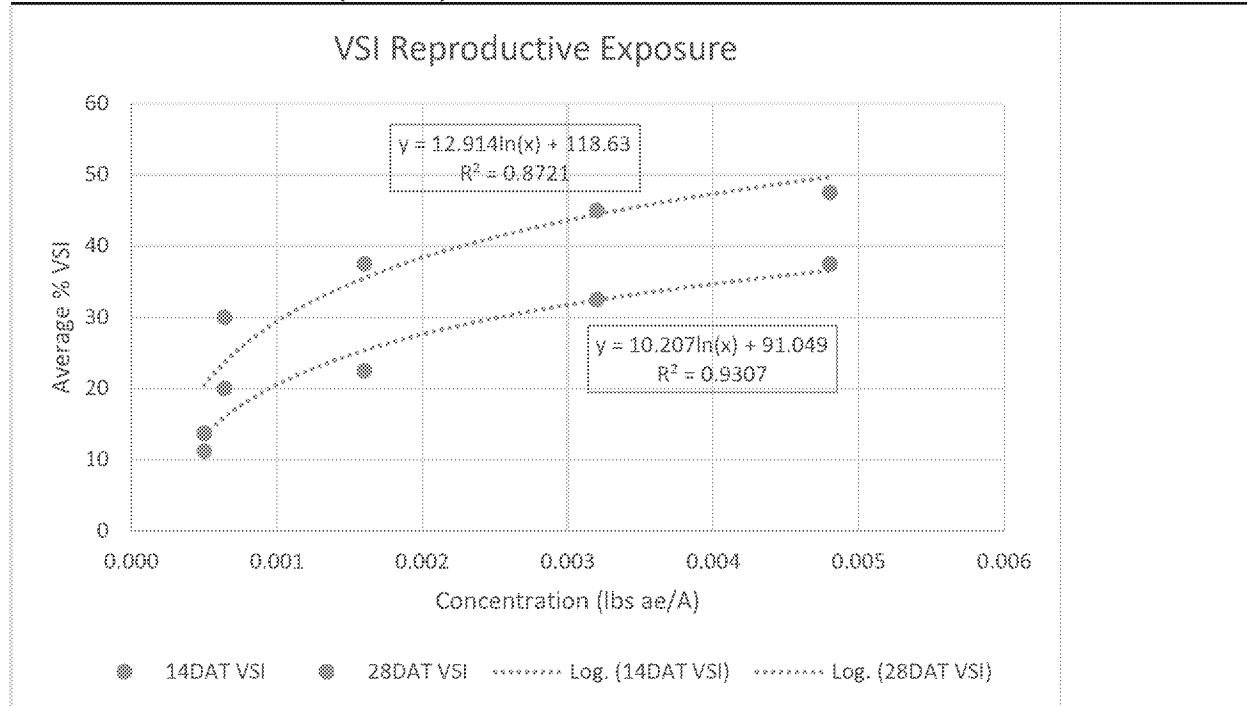


Figure 4. Logistic regression of %VSI for 14DAT and 28DAT observations of %VSI after a reproductive growth stage exposure.

D. STUDY DEFICIENCIES:

See discussion provided above

E. REVIEWER'S COMMENTS:

The vegetative growth stage with NOAEC and IC₂₅ values of 0.00035 and 0.002 lb ae/A Dicamba, respectively (corresponding to a NOAEC and IC₂₅ of 0.00039 and 0.00171 lb ae/A glyphosate, respectively) was the most sensitive measure of growth and reproduction overall. Significant response of VSI was observed for all test exposure concentrations and for both vegetative and reproduction growth stages.

Differences between the study author and reviewer's results resulted from differences in statistical methods and the study author analyzing nominal test concentrations while the reviewer analyzed measured test concentrations.

MRID 51017503 provided precipitation, temperature, and relative humidity data from 9/10/19 to 10/9/19 for the same location/site that also conducted the yield study. However, the yield study soybean crop was planted on 7/14/19 and application of test material occurred on 8/8/19 for the vegetative growth stage and 8/27/19 for the reproductive stage; the yield study was then conducted for 28 days from the time of application. Therefore, weather data was not reported for the vegetative growth stage and only a portion of the reproductive growth stage.

Application dates for the vegetative growth and reproductive stages were August 8, 2019 and August 27, 2019, respectively.

Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

PMRA Submission Number {.....}

EPA MRID Number 51017506

F. CONCLUSIONS:

See executive summary for reviewer's conclusions.

This study is scientifically sound and is classified as supplemental.

III. REFERENCES:

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ATTACHMENT 1. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION



128931+
51017506_CETIS_9-2

ATTACHMENT 2. APPLICATION RATES, CONVERSIONS AND RAW DATA EXCEL FILE



MRID51017506_MO
A-2019-0256_Missou

CETIS Summary Report

Report Date: 10 Apr-20 19:30 (p 1 of 2)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Batch ID: 18-3183-0242	Test Type: Vegetative Vigor Tier II		Analyst:		
Start Date: 27 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor		Diluent:		
Ending Date:	Species: Glycine max		Brine:		
Test Length: n/a	Taxon:		Source:		Age: R1
Sample ID: 08-2000-5254	Code: 51017506 direpr		Project:		
Sample Date: 27 Aug-19	Material: Dicamba DGA		Source: Monsanto Company		
Receipt Date:	CAS (PC):		Station:		
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

128931 51017506; Soybean yield; Reproductive stage (R1)

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
06-1688-2755	Height	Dunnett Multiple Comparison Test	0.0016	0.0032	0.002263		11.7%	1
06-3821-1704	Height	Williams Multiple Comparison Test	✓ 0.00064	0.0016	0.001012		9.11%	1
05-4717-3686	Weight	Dunnett Multiple Comparison Test	0.0048	>0.0048	n/a		21.8%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
17-0789-3913	Height	NLR: 3P Cum Log-Normal (Probit)	✓ IC5	0.000565	8.29E-05	0.00132		1
			✓ IC10	0.00154	0.000787	0.00256		
			IC25	0.00823	0.00317	0.0178		
			IC50	0.053	0.00489	0.574		
10-1274-3680	Weight	NLR: 3P Cum Log-Normal (Probit)	IC5	0.00159	n/a	0.00338		1
			IC10	0.00254	0.000431	0.00439		
			✓ IC25	0.00554	0.00235	0.00985		
			✓ IC50	0.0132	n/a	n/a		

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	73.4	60.7	86.1	68.2	85.3	3.99	7.98	10.87%	0.00%
0.0005		4	70.2	61.8	78.6	63.2	75.8	2.64	5.27	7.51%	4.36%
0.00064		4	69.5	65.2	73.7	65.5	71.4	1.34	2.68	3.86%	5.35%
0.0016		4	66.1	65.3	66.8	65.6	66.7	0.233	0.465	0.70%	10.01%
0.0032		4	61.5	51.4	71.6	55.2	68.9	3.17	6.35	10.32%	16.18%
0.0048		4	59.7	53.6	65.8	55.9	64.9	1.92	3.85	6.45%	18.66%

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2910	2150	3670	2380	3440	239	479	16.45%	0.00%
0.0005		4	2960	2560	3360	2660	3210	125	251	8.48%	-1.61%
0.00064		4	2860	2270	3440	2480	3220	183	367	12.84%	1.91%
0.0016		4	2890	2400	3380	2660	3300	153	306	10.59%	0.80%
0.0032		4	2420	1680	3170	1920	3050	234	468	19.33%	16.79%
0.0048		4	2350	1870	2830	2060	2700	151	302	12.83%	19.14%

CETIS Summary ReportReport Date: 10 Apr-20 19:30 (p 2 of 2)
Test Code/ID: 51017506 direpr / 04-5899-6442**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****MOARK Agricultural Research LLC****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	70.2	68.2	85.3	69.9
0.0005		71.9	63.2	69.9	75.8
0.00064		71.4	70.4	70.6	65.5
0.0016		66.7	65.9	65.6	66
0.0032		64.6	57.4	55.2	68.9
0.0048		58	64.9	55.9	60

Weight Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	3160	2660	3440	2380
0.0005		3210	2660	2840	3120
0.00064		3120	3220	2480	2610
0.0016		3300	2660	2930	2660
0.0032		3050	2290	1920	2420
0.0048		2520	2700	2060	2140

CETIS Summary Report

Report Date: 10 Apr-20 19:35 (p 1 of 2)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Batch ID: 18-9894-5861	Test Type: Vegetative Vigor Tier II		Analyst:		
Start Date: 08 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor		Diluent:		
Ending Date:	Species: Glycine max		Brine:		
Test Length: n/a	Taxon:		Source:		Age: V3
Sample ID: 13-8122-7732	Code: 51017506 diveg		Project:		
Sample Date: 08 Aug-19	Material: Dicamba DGA		Source: Monsanto Company		
Receipt Date:	CAS (PC):		Station:		
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

128931 51017506; Soybean yield; Vegetative growth stage (V3)

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
08-2166-4582	Height	Dunnett Multiple Comparison Test	✓ 0.00035	0.00081	0.0005324		10.7%	1
05-5712-5004	Height	Williams Multiple Comparison Test	✓ 0.00035	0.00081	0.0005324		8.3%	1
20-0290-9377	Weight	Dunnett Multiple Comparison Test	0.0087	>0.0087	n/a		25.3%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
19-1272-0336	Height	NLR: 3P Cum Log-Normal (Probit)	IC5	0.0000996	6.73E-06	0.000275		1
			IC10	0.000306	0.000123	0.000592		
			IC25	0.002	0.00143	0.00274		
			IC50	0.0162	0.00859	0.0304		
03-2092-6100	Weight	NLR: 3P Cum Log-Normal (Probit)	✓ IC5	0.0000082	n/a	n/a		1
			✓ IC10	0.0000070	n/a	n/a		
			✓ IC25	0.0000054	n/a	n/a		
			✓ IC50	0.0000040	n/a	n/a		

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	61.3	54.4	68.2	58.5	67.8	2.17	4.35	7.09%	0.00%
0.00035		4	57.9	50.5	65.4	51.7	62.9	2.35	4.69	8.10%	5.54%
0.00081		4	50.6	42.8	58.3	44.7	56.6	2.43	4.86	9.62%	17.57%
0.0017		4	47.2	45	49.5	45.3	48.6	0.711	1.42	3.01%	22.99%
0.0031		4	41.3	37.8	44.8	38.5	43.9	1.11	2.21	5.36%	32.65%
0.0087		4	37.5	30.8	44.2	32.9	43	2.11	4.22	11.24%	38.81%

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2400	1910	2880	2020	2700	152	303	12.67%	0.00%
0.00035		4	2660	1960	3360	2150	3210	221	442	16.61%	-10.99%
0.00081		4	2600	2170	3040	2380	2980	136	272	10.45%	-8.73%
0.0017		4	2820	2300	3350	2390	3120	165	330	11.69%	-17.82%
0.0031		4	2680	2010	3350	2250	3260	210	421	15.68%	-12.02%
0.0087		4	2490	1960	3020	2150	2800	167	334	13.44%	-3.84%

CETIS Summary ReportReport Date: 10 Apr-20 19:35 (p 2 of 2)
Test Code/ID: 51017506 diveg / 15-1861-5389**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****MOARK Agricultural Research LLC****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	59.3	58.5	59.7	67.8
0.00035		57.6	51.7	59.5	62.9
0.00081		44.7	50.2	50.7	56.6
0.0017		47.9	45.3	47.1	48.6
0.0031		38.5	41.2	41.6	43.9
0.0087		32.9	36.2	43	38

Weight Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	2700	2570	2290	2020
0.00035		2750	2150	2520	3210
0.00081		2440	2980	2620	2380
0.0017		2750	3120	3030	2390
0.0031		2250	2610	2620	3260
0.0087		2150	2250	2750	2800

CETIS Analytical Report

Report Date: 10 Apr-20 19:26 (p 1 of 3)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	06-1688-2755	Endpoint:	Height	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:16	Analysis:	Parametric-Control vs Treatments	Status Level:	1			
Batch ID:	18-3183-0242	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	27 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:		Species:	Glycine max	Brine:				
Test Length:	n/a	Taxon:		Source:			Age: R1	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0016	0.0032	0.002263		11.75%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.0005	0.893	2.41	8.62	6	CDF	0.4697	Non-Significant Effect	
	0.00064	1.1	2.41	8.62	6	CDF	0.3804	Non-Significant Effect	
	0.0016	2.05	2.41	8.62	6	CDF	0.0954	Non-Significant Effect	
	0.0032*	3.31	2.41	8.62	6	CDF	0.0080	Significant Effect	
	0.0048*	3.82	2.41	8.62	6	CDF	0.0027	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	564.16	112.832	5	4.4	0.0086	Significant Effect
Error	462.085	25.6714	18			
Total	1026.24		23			

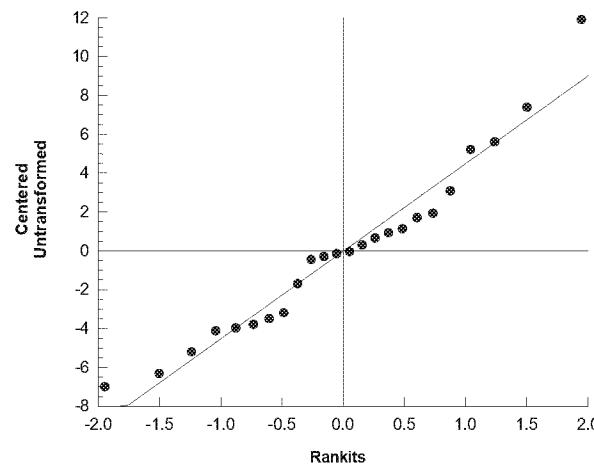
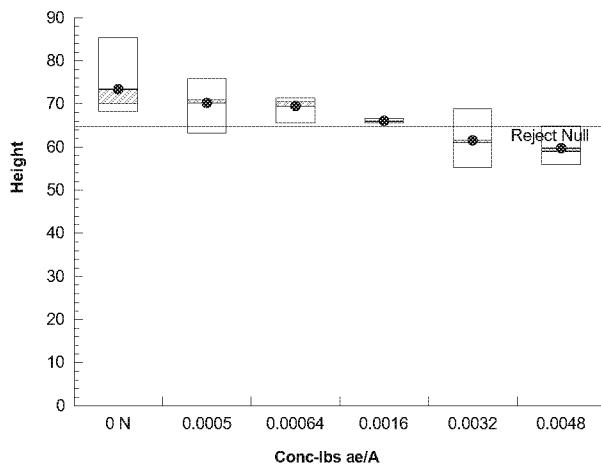
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	13.7	15.1	0.0177	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.954	0.884	0.3305	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	73.4	60.7	86.1	70.1	68.2	85.3	3.99	10.87%	0.00%
0.0005		4	70.2	61.8	78.6	70.9	63.2	75.8	2.64	7.51%	4.36%
0.00064		4	69.5	65.2	73.7	70.5	65.5	71.4	1.34	3.86%	5.35%
0.0016		4	66	65.3	66.8	65.9	65.6	66.7	0.233	0.70%	10.01%
0.0032		4	61.5	51.4	71.6	61	55.2	68.9	3.17	10.32%	16.18%
0.0048		4	59.7	53.6	65.8	59	55.9	64.9	1.92	6.45%	18.66%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:26 (p 2 of 3)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	06-3821-1704	Endpoint:	Height	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:18	Analysis:	Parametric-Control vs Ord.Treatments	Status Level:	1			
Batch ID:	18-3183-0242	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	27 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:		Species:	Glycine max	Brine:				
Test Length:	n/a	Taxon:		Source:			Age: R1	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.00064	0.0016	0.001012		9.11%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.0005	0.893	1.73	6.21	6	CDF	>0.05	Non-Significant Effect	
	0.00064	1.1	1.82	6.51	6	CDF	>0.05	Non-Significant Effect	
	0.0016*	2.05	1.85	6.61	6	CDF	<0.05	Significant Effect	
	0.0032*	3.31	1.86	6.66	6	CDF	<0.05	Significant Effect	
	0.0048*	3.82	1.87	6.69	6	CDF	<0.05	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	564.16	112.832	5	4.4	0.0086	Significant Effect
Error	462.085	25.6714	18			
Total	1026.24		23			

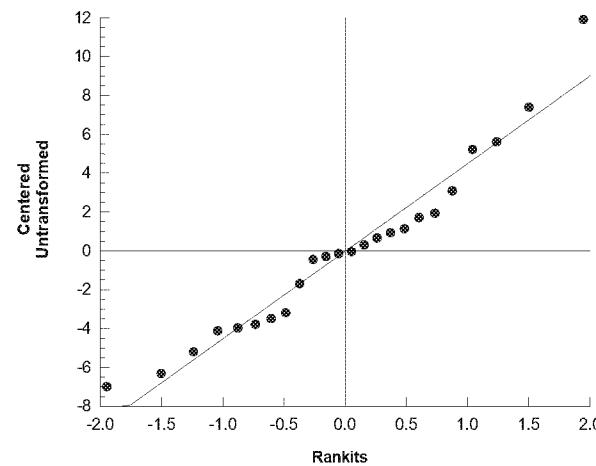
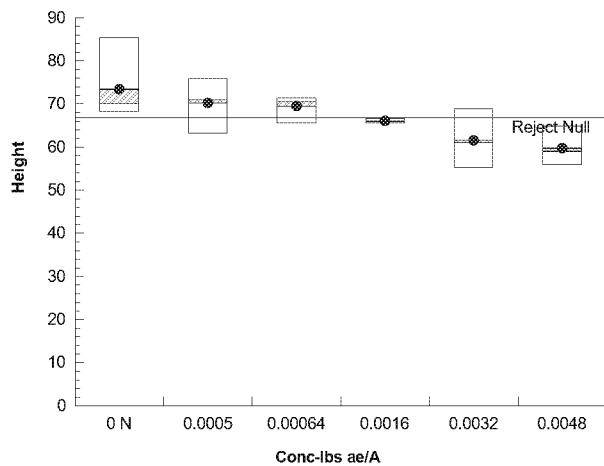
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	13.7	15.1	0.0177	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.954	0.884	0.3305	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	73.4	60.7	86.1	70.1	68.2	85.3	3.99	10.87%	0.00%
0.0005		4	70.2	61.8	78.6	70.9	63.2	75.8	2.64	7.51%	4.36%
0.00064		4	69.5	65.2	73.7	70.5	65.5	71.4	1.34	3.86%	5.35%
0.0016		4	66	65.3	66.8	65.9	65.6	66.7	0.233	0.70%	10.01%
0.0032		4	61.5	51.4	71.6	61	55.2	68.9	3.17	10.32%	16.18%
0.0048		4	59.7	53.6	65.8	59	55.9	64.9	1.92	6.45%	18.66%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:26 (p 3 of 3)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	05-4717-3686	Endpoint:	Weight	CETIS Version:	CETISv1.9.6	Status Level:	1	
Analyzed:	10 Apr-20 19:16	Analysis:	Parametric-Control vs Treatments					
Batch ID:	18-3183-0242	Test Type:	Vegetative Vigor Tier II			Analyst:		
Start Date:	27 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor			Diluent:		
Ending Date:		Species:	Glycine max			Brine:		
Test Length:	n/a	Taxon:				Source:	Age: R1	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0048	>0.0048	n/a		21.76%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.0005		-0.179	2.41	633	6	CDF	0.8805	Non-Significant Effect
	0.00064		0.211	2.41	633	6	CDF	0.7638	Non-Significant Effect
	0.0016		0.0883	2.41	633	6	CDF	0.8060	Non-Significant Effect
	0.0032		1.86	2.41	633	6	CDF	0.1323	Non-Significant Effect
	0.0048		2.12	2.41	633	6	CDF	0.0850	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	1446570	289314	5	2.09	0.1141	Non-Significant Effect
Error	2493300	138517	18			
Total	3939880		23			

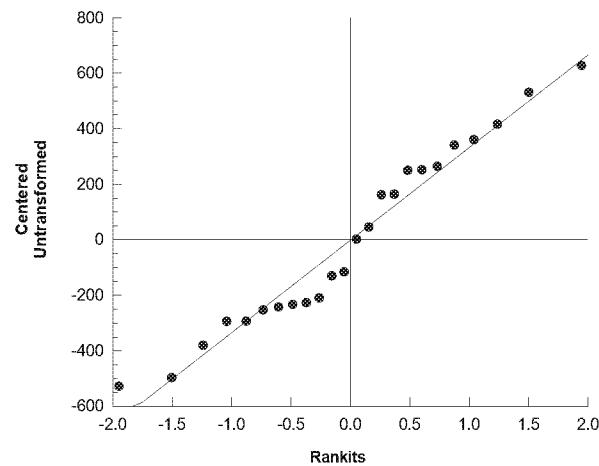
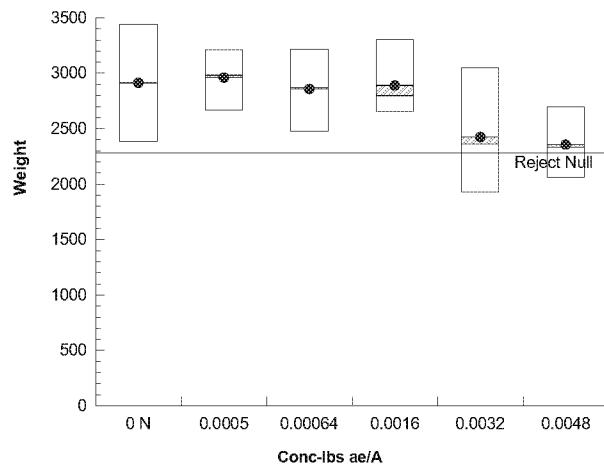
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	1.76	15.1	0.8809	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.954	0.884	0.3231	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	2910	2150	3670	2910	2380	3440	239	16.45%	0.00%
0.0005		4	2960	2560	3360	2980	2660	3210	125	8.48%	-1.61%
0.00064		4	2860	2270	3440	2870	2480	3220	183	12.84%	1.91%
0.0016		4	2890	2400	3380	2800	2660	3300	153	10.59%	0.80%
0.0032		4	2420	1680	3170	2360	1920	3050	234	19.33%	16.79%
0.0048		4	2350	1870	2830	2330	2060	2700	151	12.83%	19.14%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:27 (p 1 of 4)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID: 17-0789-3913	Endpoint: Height			CETIS Version:	CETISv1.9.6		
Analyzed: 10 Apr-20 19:16	Analysis: Nonlinear Regression (NLR)			Status Level:	1		
Batch ID: 18-3183-0242	Test Type: Vegetative Vigor Tier II			Analyst:			
Start Date: 27 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:			
Ending Date:	Species: Glycine max			Brine:			
Test Length: n/a	Taxon:			Source:			
					Age: R1		

Non-Linear Regression Options

Model Name and Function				Weighting Function		PTBS Function		X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log(x/\delta)/\gamma]]$				Normal [$\omega=1$]		Off [$\mu^*=\mu$]		None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
4	-36.1	79.3	81.6	0.5048	6.54%	73.5	Yes	0.0252	0.9944	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.000565	8.29E-05	0.00132
IC10	0.00154	0.000787	0.00256
IC25	0.00823	0.00317	0.0178
IC50	0.053	0.00489	0.574

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	73.5	2.31	68.7	78.3	31.8	<1.0E-37	Significant Parameter
γ	2.76	1.06	0.557	4.97	2.6	0.0165	Significant Parameter
δ	0.053	0.0516	-0.0544	0.16	1.03	0.3166	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	107000	35800	3	1620	<1.0E-37	Significant Effect
Lack of Fit	1.94	0.647	3	0.0252	0.9944	Non-Significant Effect
Pure Error	462	25.7	18			
Residual	464	22.1	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	13.7	11.1	0.0177	Unequal Variances
	Mod Levene Equality of Variance	1.01	2.77	0.4399	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.438	2.49	0.2994	Normal Distribution
	Shapiro-Wilk W Normality Test	0.953	0.917	0.3088	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	73.4	68.2	85.3	3.99	7.98	10.90%	0.0%
0.0005		4	70.2	63.2	75.8	2.64	5.27	7.51%	4.36%
0.00064		4	69.5	65.5	71.4	1.34	2.69	3.86%	5.35%
0.0016		4	66	65.6	66.7	0.233	0.465	0.71%	10.0%
0.0032		4	61.5	55.2	68.9	3.17	6.35	10.30%	16.2%
0.0048		4	59.7	55.9	64.9	1.92	3.85	6.45%	18.7%

CETIS Analytical Report

Report Date: 10 Apr-20 19:27 (p 2 of 4)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

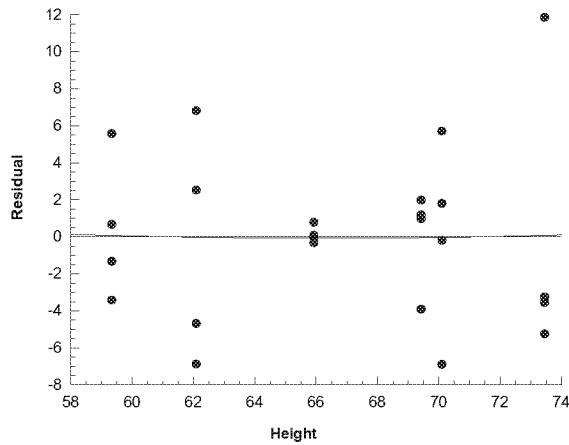
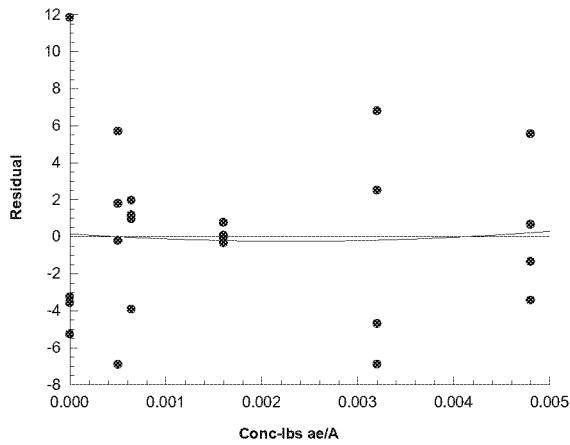
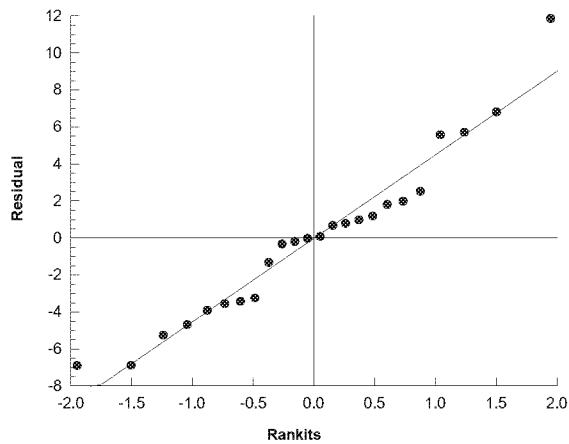
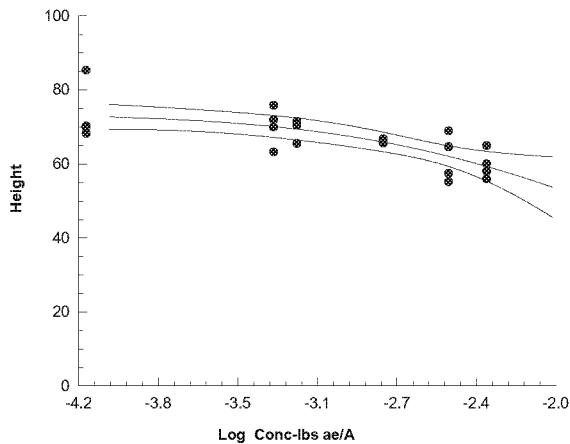
Analysis ID: 17-0789-3913
 Analyzed: 10 Apr-20 19:16

Endpoint: Height
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 10 Apr-20 19:27 (p 3 of 4)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID:	10-1274-3680	Endpoint:	Weight	CETIS Version:	CETISv1.9.6		
Analyzed:	10 Apr-20 19:16	Analysis:	Nonlinear Regression (NLR)	Status Level:	1		
Batch ID:	18-3183-0242	Test Type:	Vegetative Vigor Tier II	Analyst:			
Start Date:	27 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:			
Ending Date:		Species:	Glycine max	Brine:			
Test Length:	n/a	Taxon:		Source:			
					Age: R1		

Non-Linear Regression Options

Model Name and Function				Weighting Function		PTBS Function		X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log(x/\delta)/\gamma]]$				Normal [$\omega=1$]		Off [$\mu^*=\mu$]		None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
12	-140	287	289	0.2723	9.08%	2940	Yes	0.299	0.8256	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.00159	n/a	0.00338
IC10	0.00254	0.000431	0.00439
IC25	0.00554	0.00235	0.00985
IC50	0.0132	n/a	n/a

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	2940	128	2670	3200	22.9	<1.0E-37	Significant Parameter
γ	1.28	0.969	-0.732	3.3	1.32	0.1995	Non-Significant Parameter
δ	0.0132	0.0111	-0.00986	0.0362	1.19	0.2477	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	180000000	60100000	3	483	<1.0E-37	Significant Effect
Lack of Fit	124000	41400	3	0.299	0.8256	Non-Significant Effect
Pure Error	2490000	139000	18			
Residual	2620000	125000	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	1.76	11.1	0.8809	Equal Variances
	Mod Levene Equality of Variance	0.647	2.77	0.6674	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.549	2.49	0.1614	Normal Distribution
	Shapiro-Wilk W Normality Test	0.946	0.917	0.2233	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2910	2380	3440	239	479	16.50%	0.0%
0.0005		4	2960	2660	3210	125	251	8.48%	-1.61%
0.00064		4	2860	2480	3220	183	367	12.80%	1.91%
0.0016		4	2890	2660	3300	153	306	10.60%	0.8%
0.0032		4	2420	1920	3050	234	468	19.30%	16.8%
0.0048		4	2350	2060	2700	151	302	12.80%	19.1%

CETIS Analytical Report

Report Date: 10 Apr-20 19:27 (p 4 of 4)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

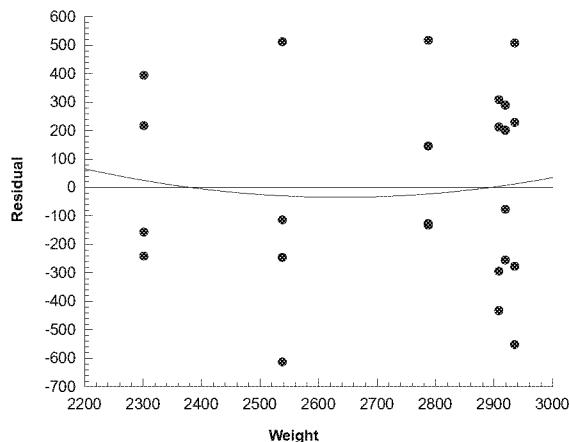
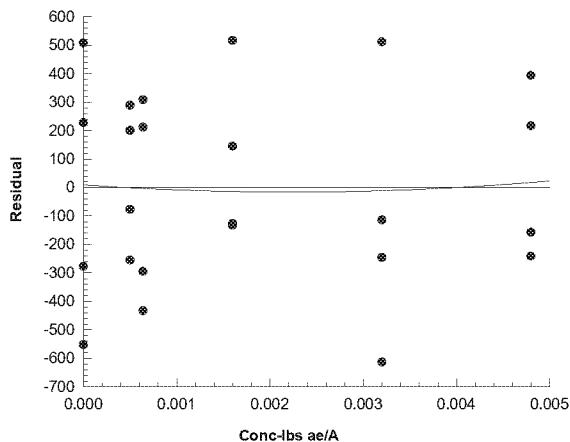
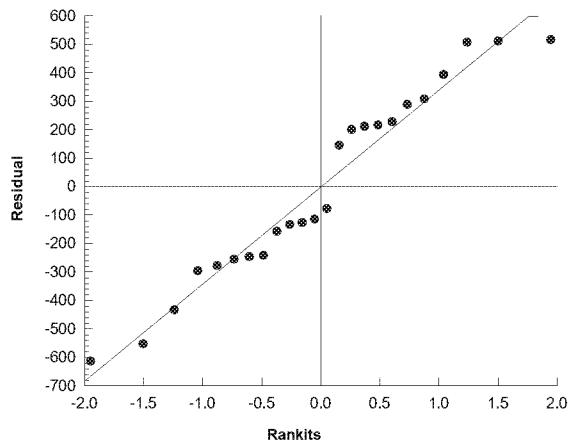
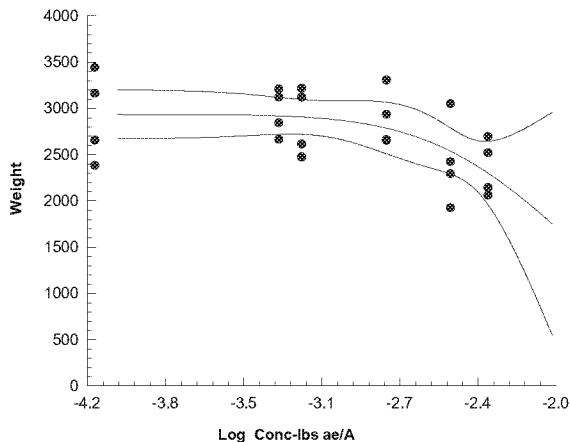
Analysis ID: 10-1274-3680
 Analyzed: 10 Apr-20 19:16

Endpoint: Weight
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 10 Apr-20 19:34 (p 1 of 3)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	08-2166-4582	Endpoint:	Height	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:31	Analysis:		Status Level:	1			
Batch ID:	18-9894-5861	Test Type:		Analyst:				
Start Date:	08 Aug-19	Protocol:		Diluent:				
Ending Date:		Species:		Brine:				
Test Length:	n/a	Taxon:		Source:		Age: V3		
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.00035	0.00081	0.0005324		10.71%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.00035		1.25	2.41	6.57	6	CDF	0.3186	Non-Significant Effect
	0.00081*		3.95	2.41	6.57	6	CDF	0.0020	Significant Effect
	0.0017*		5.17	2.41	6.57	6	CDF	1.7E-04	Significant Effect
	0.0031*		7.34	2.41	6.57	6	CDF	2.9E-05	Significant Effect
	0.0087*		8.73	2.41	6.57	6	CDF	2.7E-05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	1710.04	342.008	5	23	3.1E-07	Significant Effect
Error	267.82	14.8789	18			
Total	1977.86		23			

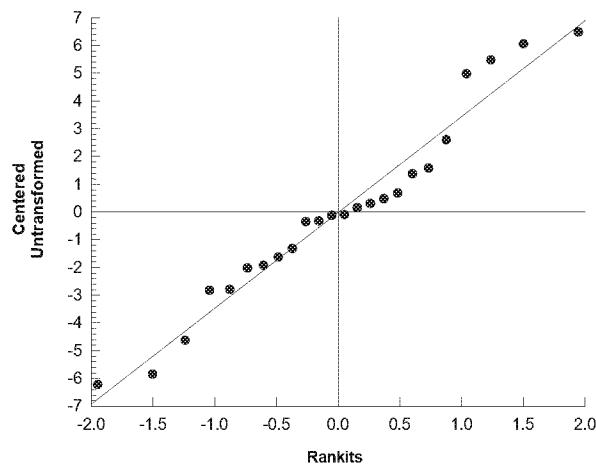
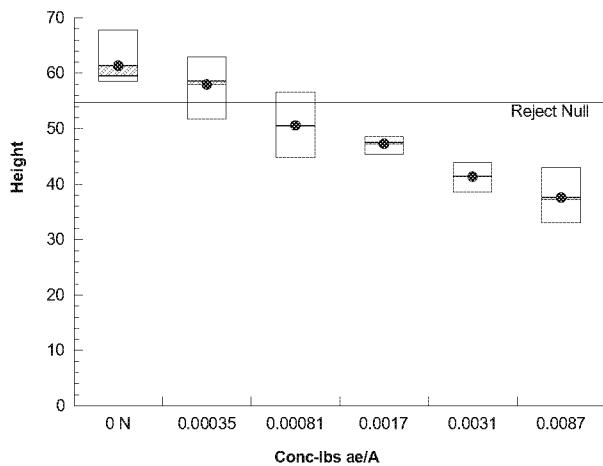
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	4.87	15.1	0.4320	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.956	0.884	0.3679	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	61.3	54.4	68.2	59.5	58.5	67.8	2.17	7.09%	0.00%
0.00035		4	57.9	50.5	65.4	58.5	51.7	62.9	2.35	8.10%	5.54%
0.00081		4	50.6	42.8	58.3	50.5	44.7	56.6	2.43	9.62%	17.57%
0.0017		4	47.2	45	49.5	47.5	45.3	48.6	0.711	3.01%	22.99%
0.0031		4	41.3	37.8	44.8	41.4	38.5	43.9	1.11	5.36%	32.65%
0.0087		4	37.5	30.8	44.2	37.1	32.9	43	2.11	11.24%	38.81%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:34 (p 2 of 3)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	05-5712-5004	Endpoint:	Height	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:31	Analysis:	Parametric-Control vs Ord.Treatments	Status Level:	1			
Batch ID:	18-9894-5861	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	08 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:		Species:	Glycine max	Brine:				
Test Length:	n/a	Taxon:		Source:			Age: V3	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.00035	0.00081	0.0005324		8.30%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control		0.00035	1.25	1.73	4.73	6	CDF	>0.05	Non-Significant Effect
		0.00081*	3.95	1.82	4.96	6	CDF	<0.05	Significant Effect
		0.0017*	5.17	1.85	5.03	6	CDF	<0.05	Significant Effect
		0.0031*	7.34	1.86	5.07	6	CDF	<0.05	Significant Effect
		0.0087*	8.73	1.87	5.09	6	CDF	<0.05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	1710.04	342.008	5	23	3.1E-07	Significant Effect
Error	267.82	14.8789	18			
Total	1977.86		23			

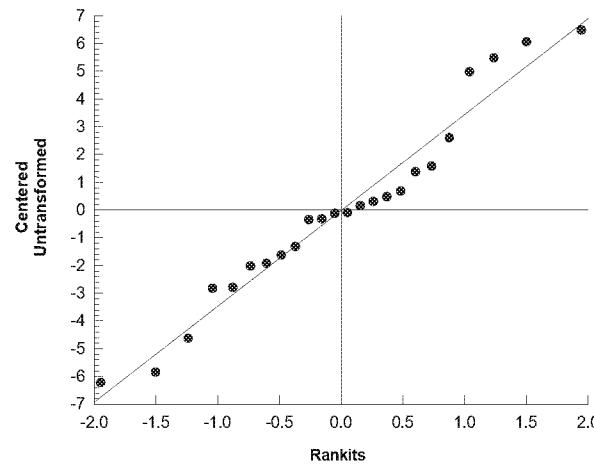
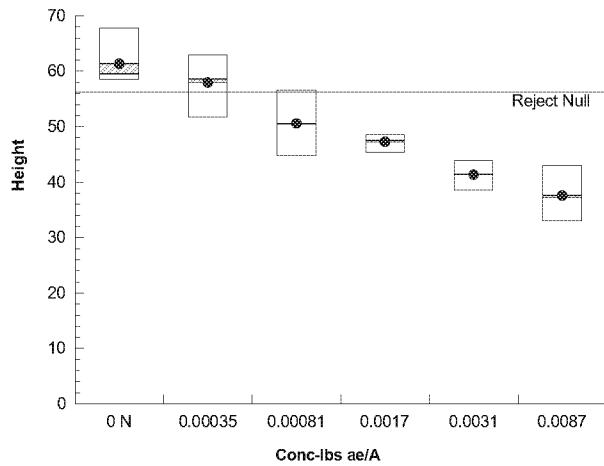
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	4.87	15.1	0.4320	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.956	0.884	0.3679	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	61.3	54.4	68.2	59.5	58.5	67.8	2.17	7.09%	0.00%
0.00035		4	57.9	50.5	65.4	58.5	51.7	62.9	2.35	8.10%	5.54%
0.00081		4	50.6	42.8	58.3	50.5	44.7	56.6	2.43	9.62%	17.57%
0.0017		4	47.2	45	49.5	47.5	45.3	48.6	0.711	3.01%	22.99%
0.0031		4	41.3	37.8	44.8	41.4	38.5	43.9	1.11	5.36%	32.65%
0.0087		4	37.5	30.8	44.2	37.1	32.9	43	2.11	11.24%	38.81%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:34 (p 3 of 3)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	20-0290-9377	Endpoint:	Weight	CETIS Version:	CETISv1.9.6	Status Level:	1	
Analyzed:	10 Apr-20 19:31	Analysis:	Parametric-Control vs Treatments					
Batch ID:	18-9894-5861	Test Type:	Vegetative Vigor Tier II			Analyst:		
Start Date:	08 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor			Diluent:		
Ending Date:		Species:	Glycine max			Brine:		
Test Length:	n/a	Taxon:				Source:	Age: V3	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0087	>0.0087	n/a		25.27%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control		0.00035	-1.05	2.41	605	6	CDF	0.9848	Non-Significant Effect
		0.00081	-0.831	2.41	605	6	CDF	0.9730	Non-Significant Effect
		0.0017	-1.7	2.41	605	6	CDF	0.9977	Non-Significant Effect
		0.0031	-1.15	2.41	605	6	CDF	0.9884	Non-Significant Effect
		0.0087	-0.366	2.41	605	6	CDF	0.9187	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	455460	91092	5	0.72	0.6166	Non-Significant Effect
Error	2275980	126443	18			
Total	2731440		23			

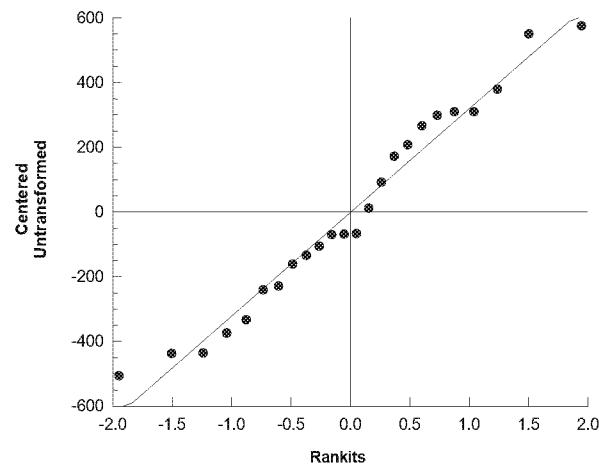
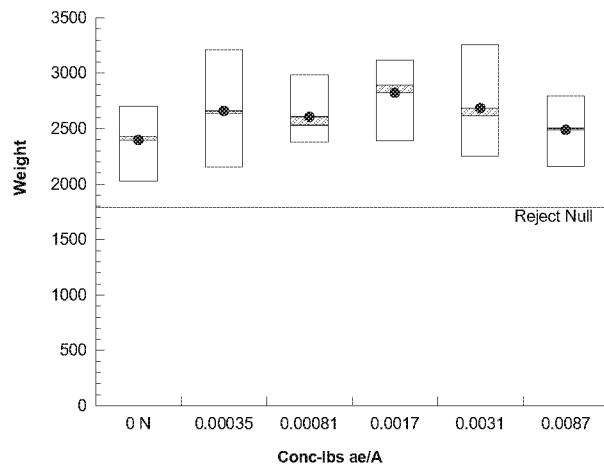
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	0.947	15.1	0.9667	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.962	0.884	0.4715	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	2400	1910	2880	2430	2020	2700	152	12.67%	0.00%
0.00035		4	2660	1960	3360	2640	2150	3210	221	16.61%	-10.99%
0.00081		4	2600	2170	3040	2530	2380	2980	136	10.45%	-8.73%
0.0017		4	2820	2300	3350	2890	2390	3120	165	11.69%	-17.82%
0.0031		4	2680	2010	3350	2610	2250	3260	210	15.68%	-12.02%
0.0087		4	2490	1960	3020	2500	2150	2800	167	13.44%	-3.84%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:34 (p 1 of 4)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID: 19-1272-0336	Endpoint: Height			CETIS Version:	CETISv1.9.6		
Analyzed: 10 Apr-20 19:31	Analysis: Nonlinear Regression (NLR)			Status Level:	1		
Batch ID: 18-9894-5861	Test Type: Vegetative Vigor Tier II			Analyst:			
Start Date: 08 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:			
Ending Date:	Species: Glycine max			Brine:			
Test Length: n/a	Taxon:			Source:	Age: V3		

Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [$\omega=1$]	Off [$\mu^*=\mu$]	None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
7	-32.1	71.4	73.7	0.8153	6.59%	62	Yes	1.47	0.2553	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.0000996	6.73E-06	0.000275
IC10	0.000306	0.000123	0.000592
IC25	0.002	0.00143	0.00274
IC50	0.0162	0.00859	0.0304

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	62	1.96	57.9	66	31.6	<1.0E-37	Significant Parameter
γ	3.09	0.526	2	4.19	5.88	7.7E-06	Significant Parameter
δ	0.0162	0.00495	0.00587	0.0264	3.27	0.0037	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	60000	20000	3	1260	<1.0E-37	Significant Effect
Lack of Fit	65.8	21.9	3	1.47	0.2553	Non-Significant Effect
Pure Error	268	14.9	18			
Residual	334	15.9	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	4.87	11.1	0.4320	Equal Variances
	Mod Levene Equality of Variance	0.481	2.77	0.7856	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.505	2.49	0.2065	Normal Distribution
	Shapiro-Wilk W Normality Test	0.956	0.917	0.3713	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	61.3	58.5	67.8	2.17	4.35	7.09%	0.0%
0.00035		4	57.9	51.7	62.9	2.35	4.69	8.10%	5.54%
0.00081		4	50.6	44.7	56.6	2.43	4.86	9.62%	17.6%
0.0017		4	47.2	45.3	48.6	0.711	1.42	3.01%	23.0%
0.0031		4	41.3	38.5	43.9	1.11	2.21	5.36%	32.7%
0.0087		4	37.5	32.9	43	2.11	4.22	11.20%	38.8%

CETIS Analytical Report

Report Date: 10 Apr-20 19:34 (p 2 of 4)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

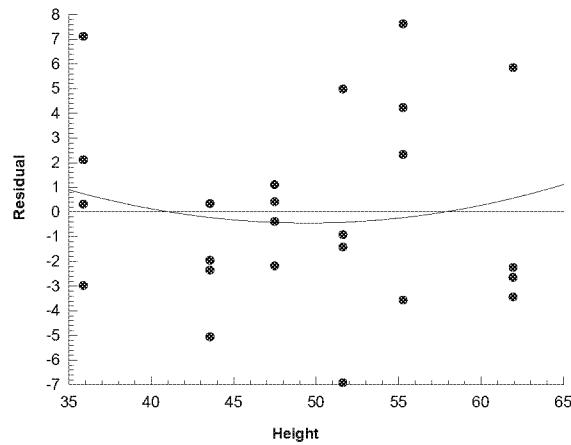
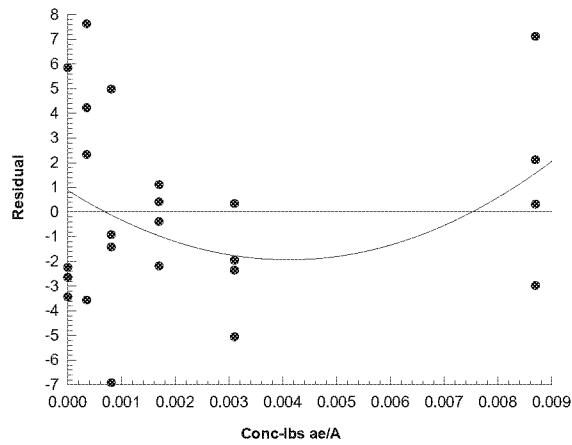
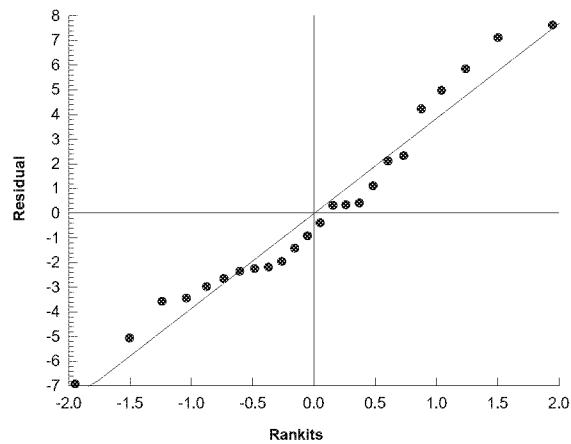
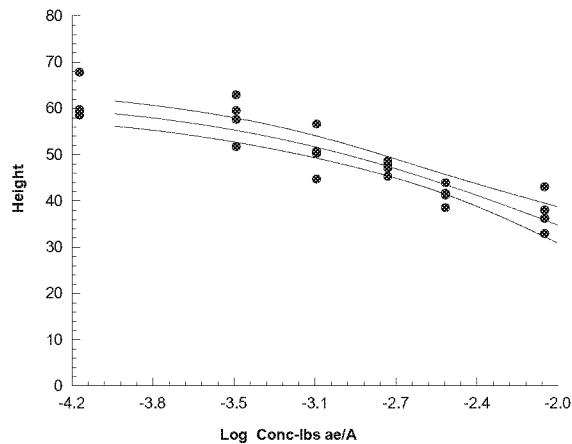
Analysis ID: 19-1272-0336
 Analyzed: 10 Apr-20 19:31

Endpoint: Height
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 10 Apr-20 19:34 (p 3 of 4)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID: 03-2092-6100	Endpoint: Weight			CETIS Version:	CETISv1.9.6		
Analyzed: 10 Apr-20 19:31	Analysis: Nonlinear Regression (NLR)			Status Level:	1		
Batch ID: 18-9894-5861	Test Type: Vegetative Vigor Tier II			Analyst:			
Start Date: 08 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:			
Ending Date:	Species: Glycine max			Brine:			
Test Length: n/a	Taxon:			Source:	Age: V3		

Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu=\alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [$\omega=1$]	Off [$\mu^*=\mu$]	None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
7	-140	288	290		6.47%	2590	Yes	1.21	0.3356	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.0000082	n/a	n/a
IC10	0.0000070	n/a	n/a
IC25	0.0000054	n/a	n/a
IC50	0.0000040	n/a	n/a

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	2590	80.7	2430	2760	32.1	<1.0E-37	Significant Parameter
γ	-0.435	3.16E+20	-6.6E+20	6.57E+20	-1.4E-21	1.0000	Non-Significant Parameter
δ	4.03E-06	1.31E+16	-2.7E+16	2.72E+16	3.08E-22	1.0000	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	163000000	54400000	3	418	<1.0E-37	Significant Effect
Lack of Fit	458000	153000	3	1.21	0.3356	Non-Significant Effect
Pure Error	2280000	126000	18			
Residual	2730000	130000	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	0.947	11.1	0.9667	Equal Variances
	Mod Levene Equality of Variance	0.185	2.77	0.9647	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.271	2.49	0.7011	Normal Distribution
	Shapiro-Wilk W Normality Test	0.968	0.917	0.6287	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2400	2020	2700	152	303	12.70%	0.0%
0.00035		4	2660	2150	3210	221	442	16.60%	-11.0%
0.00081		4	2600	2380	2980	136	272	10.40%	-8.73%
0.0017		4	2820	2390	3120	165	330	11.70%	-17.8%
0.0031		4	2680	2250	3260	210	421	15.70%	-12.0%
0.0087		4	2490	2150	2800	167	334	13.40%	-3.84%

CETIS Analytical Report

Report Date: 10 Apr-20 19:34 (p 4 of 4)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

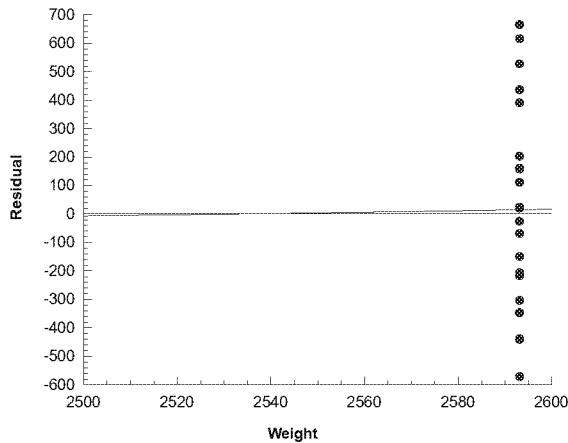
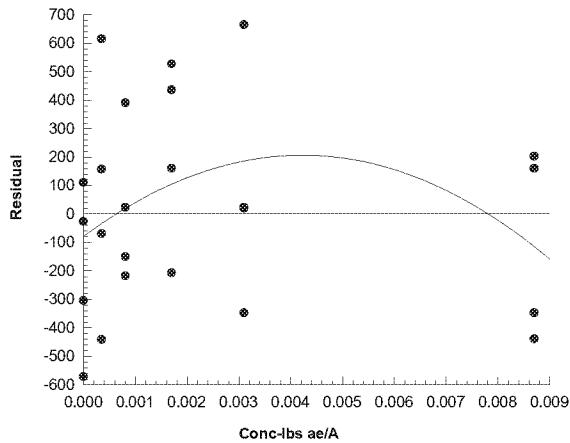
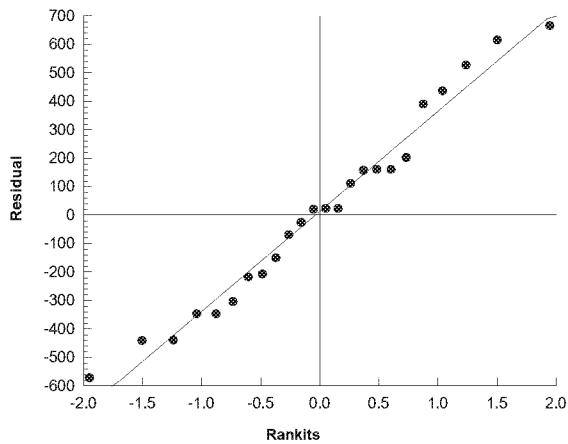
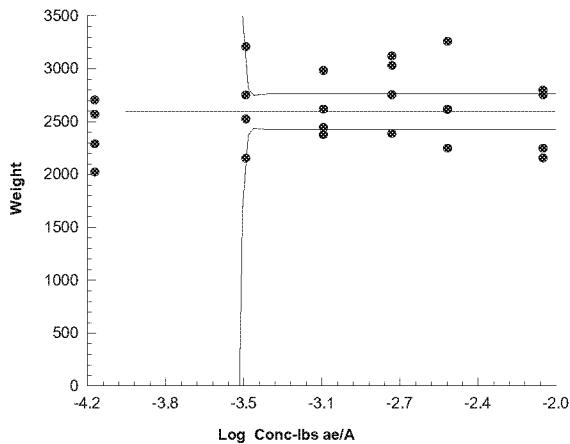
Analysis ID: 03-2092-6100
 Analyzed: 10 Apr-20 19:31

Endpoint: Weight
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 1 of 2)
 Test Code/ID: 51017506 DV14 / 02-7838-1766

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Analysis ID: 06-7753-0311	Endpoint: Height				CETIS Version: CETISv1.9.6
Analyzed: 26 May-20 21:24	Analysis: Nonlinear Regression (NLR)				Status Level: 1
Batch ID: 16-7312-9367	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 08 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 26 May-20 21:04	Species: Glycine max				Brine:
Test Length: 292d 21h	Taxon:				Source: Age:
Sample ID: 14-9676-7987	Code: 5936DDF3				Project:
Sample Date: 08 Aug-19	Material: Dicamba DGA				Source: Monsanto Company
Receipt Date: 26 May-20 21:04	CAS (PC):				Station:
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

Non-Linear Regression Options

Model Name and Function		Weighting Function		PTBS Function		X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$		Normal [$\omega=1$]		Off [$\mu^*=\mu$]		None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
15	-17.85	42.89	45.23	0.8217	6.81%	31.21	Yes	2.708	0.0758	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.0003364	7.256E-05	0.0006511
IC10	0.000729	0.0003918	0.001142
IC15	0.001229	0.0007922	0.001762
IC20	0.00186	0.001322	0.002513
IC25	0.002655	0.001994	0.003452
IC40	0.006509	0.004757	0.008804
IC50	0.01116	0.007299	0.01707

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	31.21	1.022	29.08	33.34	30.53	<1.0E-37	Significant Parameter
γ	2.129	0.3681	1.364	2.895	5.784	9.7E-06	Significant Parameter
δ	0.01116	0.002279	0.006424	0.0159	4.899	7.6E-05	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	16280	5426	3	1120	<1.0E-37	Significant Effect
Lack of Fit	31.65	10.55	3	2.708	0.0758	Non-Significant Effect
Pure Error	70.11	3.895	18			
Residual	101.8	4.846	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	11.87	11.07	0.0367	Unequal Variances
	Mod Levene Equality of Variance	2.014	2.773	0.1252	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.6578	2.492	0.0863	Normal Distribution
	Shapiro-Wilk W Normality Test	0.9381	0.9169	0.1479	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	30.5	27.1	34	1.562	3.123	10.24%	0.0%
0.00035		4	30.65	27	32.5	1.265	2.53	8.26%	-0.49%
0.00081		4	28.1	26	30.9	1.026	2.051	7.30%	7.87%
0.0017		4	25.93	23.8	27.2	0.7387	1.477	5.70%	15.0%
0.0031		4	20.47	19.8	21.7	0.427	0.8539	4.17%	32.87%
0.0087		4	18.07	17.8	18.5	0.1548	0.3096	1.71%	40.74%

CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 2 of 2)
 Test Code/ID: 51017506 DV14 / 02-7838-1766

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

Analysis ID: 06-7753-0311 Endpoint: Height
 Analyzed: 26 May-20 21:24 Analysis: Nonlinear Regression (NLR)

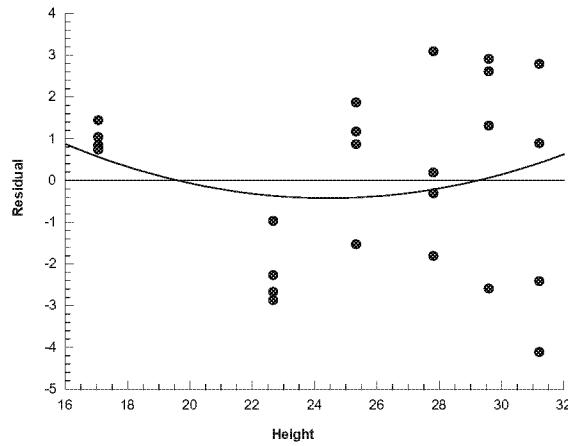
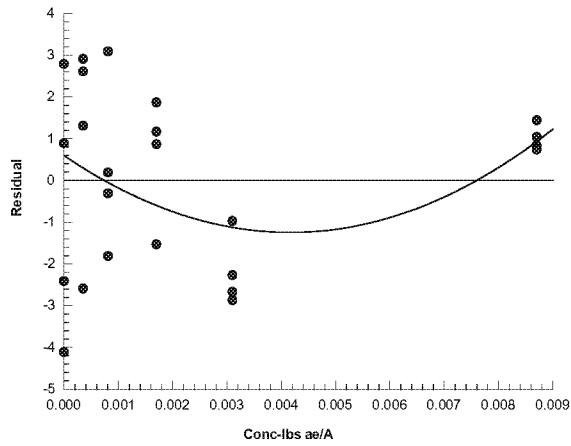
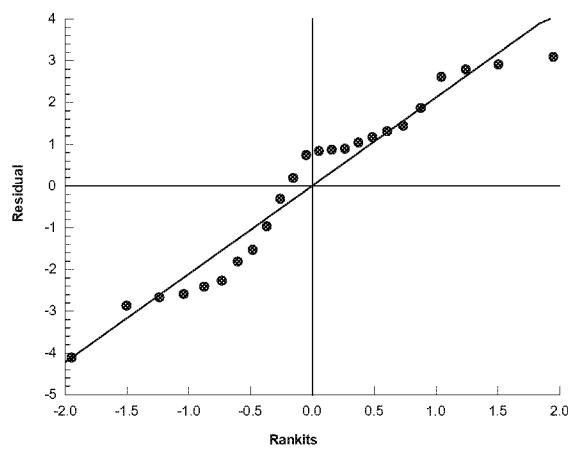
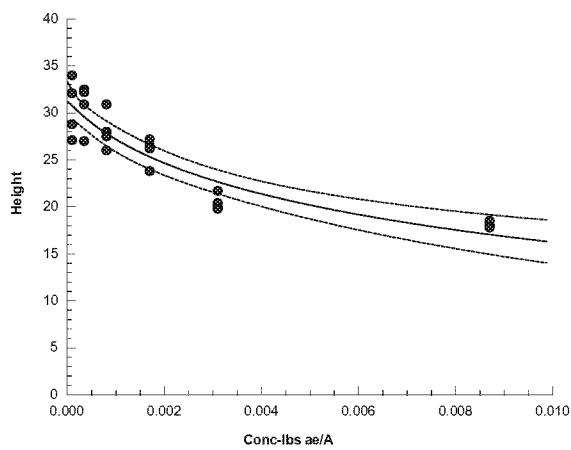
CETIS Version: CETISv1.9.6
 Status Level: 1

Height Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	32.1	28.8	27.1	34
0.00035		30.9	27	32.5	32.2
0.00081		26	28	27.5	30.9
0.0017		26.5	26.2	27.2	23.8
0.0031		20	20.4	19.8	21.7
0.0087		18.1	18.5	17.9	17.8

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 27 May-20 00:28 (p 1 of 2)
 Test Code/ID: 51017506 Dr14 / 14-4383-2724

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Analysis ID: 19-7560-7391	Endpoint: Height				CETIS Version: CETISv1.9.6
Analyzed: 26 May-20 21:06	Analysis: Nonlinear Regression (NLR)				Status Level: 1
Batch ID: 12-3839-2312	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 27 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 26 May-20 21:04	Species: Glycine max				Brine:
Test Length: 273d 21h	Taxon:				Source: Age:
Sample ID: 06-4568-2845	Code: 267C569D				Project:
Sample Date: 27 Aug-19	Material: Dicamba DGA				Source: Monsanto Company
Receipt Date: 26 May-20 21:04	CAS (PC):				Station:
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

Non-Linear Regression Options

Model Name and Function		Weighting Function		PTBS Function		X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$		Normal [$\omega=1$]		Off [$\mu^*=\mu$]		None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
17	-34.2	75.6	77.94	0.4327	5.68%	67.69	Yes	0.257	0.8553	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.001569	0.0002018	0.002873
IC10	0.00294	0.001775	0.004235
IC15	0.004492	0.002826	0.006446
IC20	0.006291	0.00292	0.01093
IC25	0.0084	0.002612	0.01831
IC40	0.0174	0.001308	0.09142
IC50	0.02696	0.0008001	0.9086

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	67.69	1.849	63.85	71.54	36.61	<1.0E-37	Significant Parameter
γ	1.729	0.9423	-0.2305	3.689	1.835	0.0807	Non-Significant Parameter
δ	0.02696	0.02602	-0.02714	0.08107	1.036	0.3118	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	98060	32690	3	1726	<1.0E-37	Significant Effect
Lack of Fit	16.34	5.446	3	0.257	0.8553	Non-Significant Effect
Pure Error	381.3	21.19	18			
Residual	397.7	18.94	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	6.345	11.07	0.2741	Equal Variances
	Mod Levene Equality of Variance	1.354	2.773	0.2873	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.2333	2.492	0.8264	Normal Distribution
	Shapiro-Wilk W Normality Test	0.9866	0.9169	0.9809	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	67.05	63.5	73.2	2.118	4.235	6.32%	0.0%
0.0005		4	68.07	64	71.5	1.708	3.417	5.02%	-1.53%
0.00064		4	66.3	61.8	70	1.69	3.379	5.10%	1.12%
0.0016		4	64.7	62.7	66.4	0.8195	1.639	2.53%	3.51%
0.0032		4	59.05	51.6	69.4	3.965	7.929	13.43%	11.93%
0.0048		4	57.62	54	64.2	2.265	4.53	7.86%	14.06%

CETIS Analytical Report

Report Date: 27 May-20 00:28 (p 2 of 2)
 Test Code/ID: 51017506 Dr14 / 14-4383-2724

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

Analysis ID: 19-7560-7391

Endpoint: Height

CETIS Version: CETISv1.9.6

Analyzed: 26 May-20 21:06

Analysis: Nonlinear Regression (NLR)

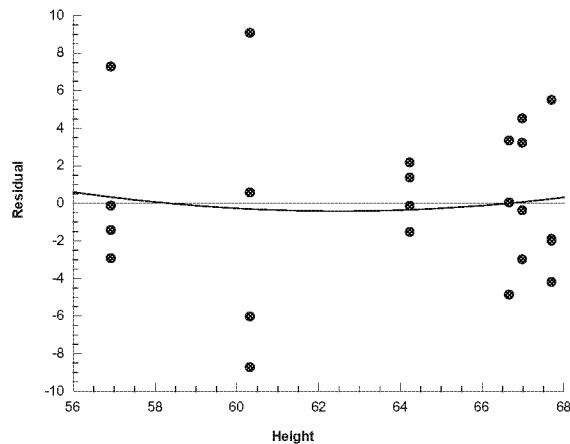
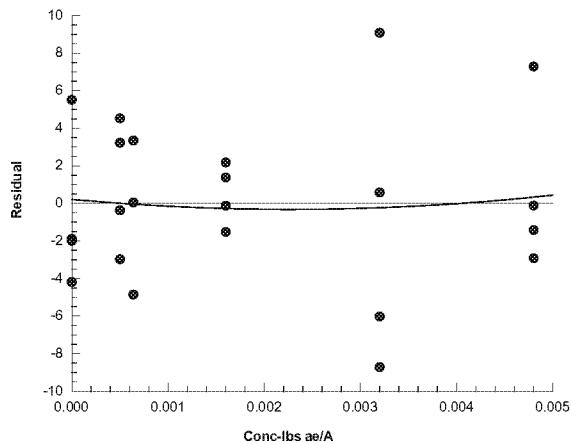
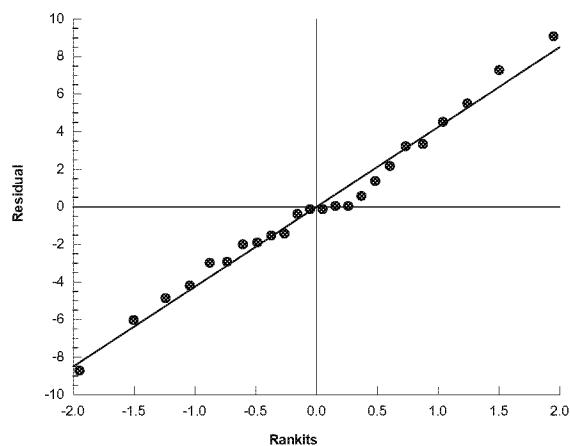
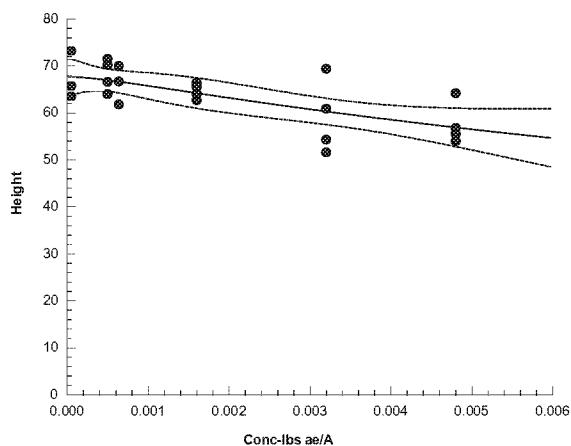
Status Level: 1

Height Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	65.8	65.7	73.2	63.5
0.0005		71.5	64	66.6	70.2
0.00064		66.7	70	66.7	61.8
0.0016		66.4	62.7	64.1	65.6
0.0032		60.9	51.6	54.3	69.4
0.0048		56.8	64.2	55.5	54

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 27 May-20 00:28 (p 1 of 2)
 Test Code/ID: 51017506 Dr14 / 14-4383-2724

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Analysis ID: 09-6784-4353	Endpoint: Height				CETIS Version: CETISv1.9.6
Analyzed: 26 May-20 21:06	Analysis: Parametric-Control vs Ord.Treatments				Status Level: 1
Batch ID: 12-3839-2312	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 27 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 26 May-20 21:04	Species: Glycine max				Brine:
Test Length: 273d 21h	Taxon:				Source: Age:
Sample ID: 06-4568-2845	Code: 267C569D				Project:
Sample Date: 27 Aug-19	Material: Dicamba DGA				Source: Monsanto Company
Receipt Date: 26 May-20 21:04	CAS (PC):				Station:
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.0016	0.0032	0.002263		9.06%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.0005	-0.3149	1.734	5.644	6	CDF	>0.05	Non-Significant Effect	
	0.00064	0.2304	1.818	5.917	6	CDF	>0.05	Non-Significant Effect	
	0.0016	0.722	1.845	6.005	6	CDF	>0.05	Non-Significant Effect	
	0.0032*	2.458	1.859	6.05	6	CDF	<0.05	Significant Effect	
	0.0048*	2.896	1.867	6.076	6	CDF	<0.05	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	386.365	77.273	5	3.647	0.0187	Significant Effect
Error	381.335	21.1853	18			
Total	767.7		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	6.345	15.09	0.2741	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9686	0.884	0.6327	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	67.05	60.31	73.79	65.75	63.5	73.2	2.118	6.32%	0.00%
0.0005		4	68.07	62.64	73.51	68.4	64	71.5	1.708	5.02%	-1.53%
0.00064		4	66.3	60.92	71.68	66.7	61.8	70	1.69	5.10%	1.12%
0.0016		4	64.7	62.09	67.31	64.85	62.7	66.4	0.8195	2.53%	3.50%
0.0032		4	59.05	46.43	71.67	57.6	51.6	69.4	3.965	13.43%	11.93%
0.0048		4	57.62	50.42	64.83	56.15	54	64.2	2.265	7.86%	14.06%

Height Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	65.8	65.7	73.2	63.5
0.0005		71.5	64	66.6	70.2
0.00064		66.7	70	66.7	61.8
0.0016		66.4	62.7	64.1	65.6
0.0032		60.9	51.6	54.3	69.4
0.0048		56.8	64.2	55.5	54

CETIS Analytical Report

Report Date: 27 May-20 00:28 (p 2 of 2)
Test Code/ID: 51017506 Dr14 / 14-4383-2724

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

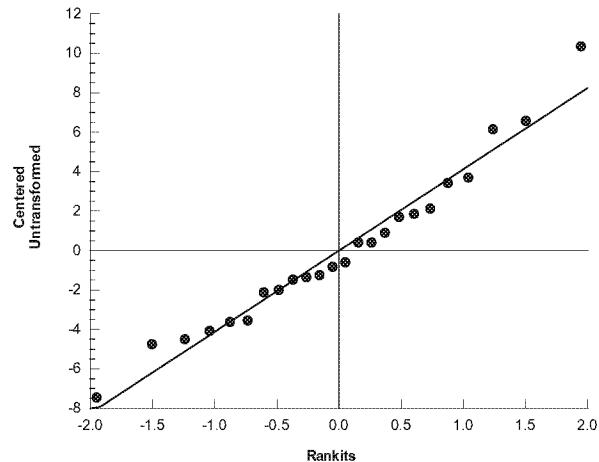
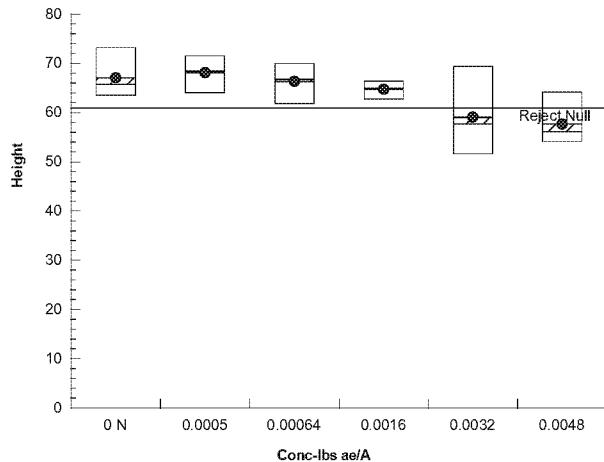
MOARK Agricultural Research LLC

Analysis ID: 09-6784-4353
Analyzed: 26 May-20 21:06

Endpoint: Height
Analysis: Parametric-Control vs Ord.Treatments

CETIS Version: CETISv1.9.6
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 1 of 2)
 Test Code/ID: 51017506 DV14 / 02-7838-1766

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Analysis ID: 08-3470-6607	Endpoint: Height				CETIS Version: CETISv1.9.6
Analyzed: 26 May-20 21:24	Analysis: Parametric-Control vs Ord.Treatments				Status Level: 1
Batch ID: 16-7312-9367	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 08 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 26 May-20 21:04	Species: Glycine max				Brine:
Test Length: 292d 21h	Taxon:				Source: Age:
Sample ID: 14-9676-7987	Code: 5936DDF3				Project:
Sample Date: 08 Aug-19	Material: Dicamba DGA				Source: Monsanto Company
Receipt Date: 26 May-20 21:04	CAS (PC):				Station:
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.00081	0.0017	0.001173		8.54%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision($\alpha:5\%$)
Negative Control	0.00035	-0.1075	1.734	2.42	6	CDF	>0.05	Non-Significant Effect	
	0.00081	1.72	1.818	2.537	6	CDF	>0.05	Non-Significant Effect	
	0.0017*	3.278	1.845	2.575	6	CDF	<0.05	Significant Effect	
	0.0031*	7.184	1.859	2.594	6	CDF	<0.05	Significant Effect	
	0.0087*	8.903	1.867	2.605	6	CDF	<0.05	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Between	555.027	111.005	5	28.5	<1.0E-37	Significant Effect
Error	70.1125	3.89514	18			
Total	625.14		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision($\alpha:1\%$)
Variance	Bartlett Equality of Variance Test	11.87	15.09	0.0367	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9709	0.884	0.6899	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	30.5	25.53	35.47	30.45	27.1	34	1.562	10.24%	0.00%
0.00035		4	30.65	26.62	34.68	31.55	27	32.5	1.265	8.26%	-0.49%
0.00081		4	28.1	24.84	31.36	27.75	26	30.9	1.026	7.30%	7.87%
0.0017		4	25.93	23.57	28.28	26.35	23.8	27.2	0.7387	5.70%	15.00%
0.0031		4	20.47	19.12	21.83	20.2	19.8	21.7	0.427	4.17%	32.87%
0.0087		4	18.07	17.58	18.57	18	17.8	18.5	0.1548	1.71%	40.74%

Height Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	32.1	28.8	27.1	34
0.00035		30.9	27	32.5	32.2
0.00081		26	28	27.5	30.9
0.0017		26.5	26.2	27.2	23.8
0.0031		20	20.4	19.8	21.7
0.0087		18.1	18.5	17.9	17.8

CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 2 of 2)
Test Code/ID: 51017506 DV14 / 02-7838-1766

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

Analysis ID: 08-3470-6607

Endpoint: Height

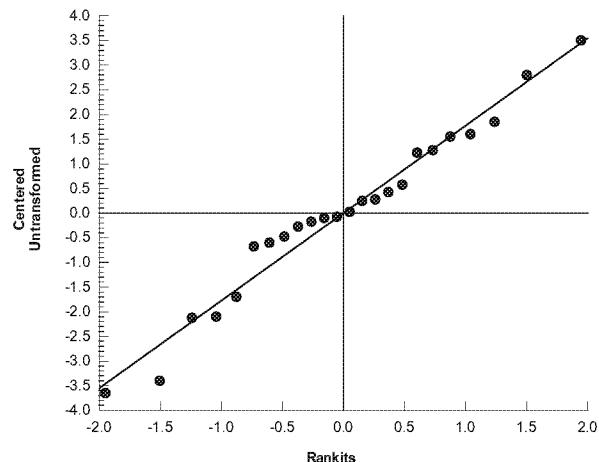
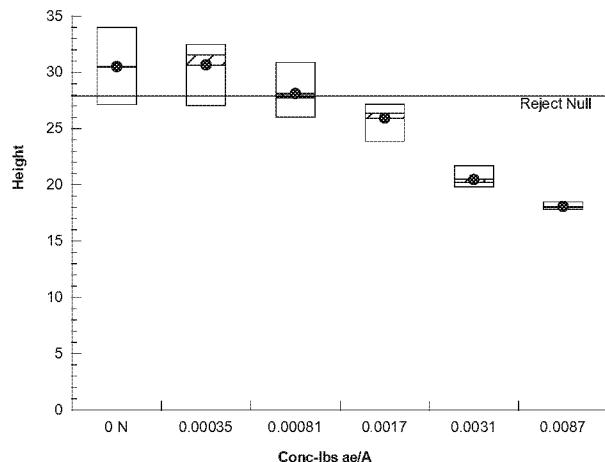
Analyzed: 26 May-20 21:24

Analysis: Parametric-Control vs Ord.Treatments

CETIS Version: CETISv1.9.6

Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 27 May-20 00:31 (p 1 of 2)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID: 04-3234-9891	Endpoint: Weight			CETIS Version:	CETISv1.9.6		
Analyzed: 26 May-20 21:13	Analysis: Parametric-Control vs Ord.Treatments			Status Level:	1		
Batch ID: 18-3183-0242	Test Type: Vegetative Vigor Tier II			Analyst:			
Start Date: 27 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:			
Ending Date:	Species: Glycine max			Brine:			
Test Length: n/a	Taxon:			Source:			
Sample ID: 08-2000-5254	Code: 51017506 direpr			Project:			
Sample Date: 27 Aug-19	Material: Dicamba DGA			Source: Monsanto Company			
Receipt Date:	CAS (PC):			Station:			
Sample Age: n/a	Client: CDM Smith - K. Bozicevich			Age: R1			

128931 51017506; Soybean yield; Reproductive stage (R1)

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.0032	0.0048	0.003919		16.88%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision($\alpha:5\%$)
Negative Control	0.0005	-0.1786	1.734	456.3	6	CDF	>0.05	Non-Significant Effect	
	0.00064	0.2109	1.818	478.4	6	CDF	>0.05	Non-Significant Effect	
	0.0016	0.1496	1.845	485.5	6	CDF	>0.05	Non-Significant Effect	
	0.0032	1.857	1.859	489.2	6	CDF	>0.05	Non-Significant Effect	
	0.0048*	2.117	1.867	491.3	6	CDF	<0.05	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Between	1446570	289314	5	2.089	0.1141	Non-Significant Effect
Error	2493300	138517	18			
Total	3939880		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision($\alpha:1\%$)
Variance	Bartlett Equality of Variance Test	1.763	15.09	0.8809	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9536	0.884	0.3231	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	2912	2149	3674	2910	2383	3442	239.5	16.45%	0.00%
0.0005		4	2958	2559	3358	2981	2664	3208	125.4	8.48%	-1.61%
0.00064		4	2856	2272	3440	2866	2475	3216	183.4	12.84%	1.91%
0.0016		4	2888	2401	3375	2797	2655	3304	153	10.59%	0.80%
0.0032		4	2423	1677	3168	2358	1925	3050	234.2	19.33%	16.79%
0.0048		4	2354	1874	2835	2331	2060	2695	151	12.83%	19.14%

Weight Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	3163	2658	3442	2383
0.0005		3208	2664	2842	3120
0.00064		3120	3216	2475	2613
0.0016		3304	2655	2933	2661
0.0032		3050	2292	1925	2424
0.0048		2518	2695	2060	2144

CETIS Analytical Report

Report Date: 27 May-20 00:31 (p 2 of 2)
Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

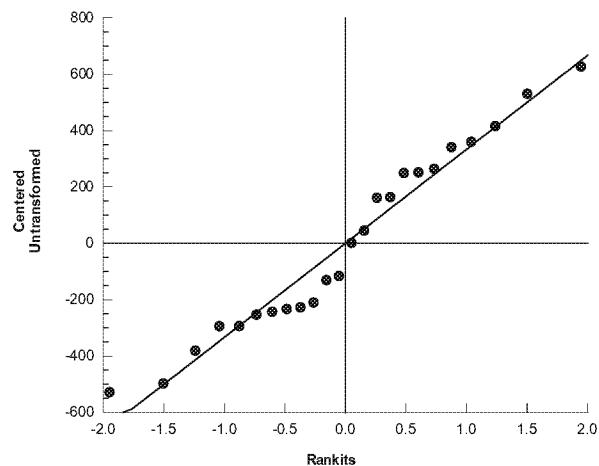
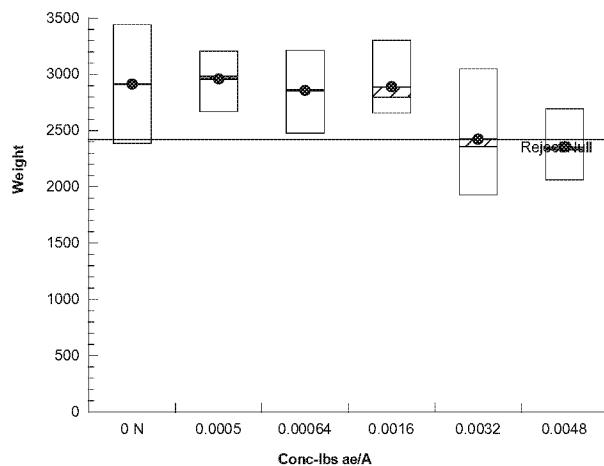
MOARK Agricultural Research LLC

Analysis ID: 04-3234-9891
Analyzed: 26 May-20 21:13

Endpoint: Weight
Analysis: Parametric-Control vs Ord.Treatments

CETIS Version: CETISv1.9.6
Status Level: 1

Graphics



CETIS Summary Report

Report Date: 10 Apr-20 19:44 (p 1 of 2)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Batch ID: 07-1814-7311	Test Type: Vegetative Vigor Tier II		Analyst:		
Start Date: 27 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor		Diluent:		
Ending Date:	Species: Glycine max		Brine:		
Test Length: n/a	Taxon:		Source:		Age: R1
Sample ID: 13-1848-0856	Code: 51017506 glyrep		Project:		
Sample Date: 27 Aug-19	Material: Glyphosate		Source: Monsanto Company		
Receipt Date:	CAS (PC):		Station:		
Sample Age: 1m	Client: CDM Smith - K. Bozicevich				

128931 51017506; Soybean yield; Reproductive stage (R1)

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
06-7854-9610	Height	Dunnett Multiple Comparison Test	0.002	0.0042	0.002898		11.7%	1
13-7177-9167	Height	Williams Multiple Comparison Test	✓ 0.0009	0.002	0.001342		9.11%	1
16-4417-7537	Weight	Dunnett Multiple Comparison Test	0.0086	>0.0086	n/a		21.8%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
03-2429-8007	Height	NLR: 3P Cum Log-Normal (Probit)	✓ IC5	0.00053	4.29E-05	0.00158		1
			✓ IC10	0.00191	0.000811	0.00367		
			IC25	0.0163	0.00467	0.0445		
			IC50	0.176	0.00804	3.87		
21-0974-7529	Weight	NLR: 3P Cum Log-Normal (Probit)	IC5	0.00157	n/a	0.00427		1
			IC10	0.00317	0.000607	0.00663		
			✓ IC25	0.0103	0.00313	0.0235		
			✓ IC50	0.0382	n/a	n/a		

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	73.4	60.7	86.1	68.2	85.3	3.99	7.98	10.87%	0.00%
0.00035		4	70.2	61.8	78.6	63.2	75.8	2.64	5.27	7.51%	4.36%
0.0009		4	69.5	65.2	73.7	65.5	71.4	1.34	2.68	3.86%	5.35%
0.002		4	66.1	65.3	66.8	65.6	66.7	0.233	0.465	0.70%	10.01%
0.0042		4	61.5	51.4	71.6	55.2	68.9	3.17	6.35	10.32%	16.18%
0.0086		4	59.7	53.6	65.8	55.9	64.9	1.92	3.85	6.45%	18.66%

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2910	2150	3670	2380	3440	239	479	16.45%	0.00%
0.00035		4	2960	2560	3360	2660	3210	125	251	8.48%	-1.61%
0.0009		4	2860	2270	3440	2480	3220	183	367	12.84%	1.91%
0.002		4	2890	2400	3380	2660	3300	153	306	10.59%	0.80%
0.0042		4	2420	1680	3170	1920	3050	234	468	19.33%	16.79%
0.0086		4	2350	1870	2830	2060	2700	151	302	12.83%	19.14%

CETIS Summary ReportReport Date: 10 Apr-20 19:44 (p 2 of 2)
Test Code/ID: 51017506 glyrep / 01-4248-4352**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****MOARK Agricultural Research LLC****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	70.2	68.2	85.3	69.9
0.00035		71.9	63.2	69.9	75.8
0.0009		71.4	70.4	70.6	65.5
0.002		66.7	65.9	65.6	66
0.0042		64.6	57.4	55.2	68.9
0.0086		58	64.9	55.9	60

Weight Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	3160	2660	3440	2380
0.00035		3210	2660	2840	3120
0.0009		3120	3220	2480	2610
0.002		3300	2660	2930	2660
0.0042		3050	2290	1920	2420
0.0086		2520	2700	2060	2140

CETIS Summary Report

Report Date: 10 Apr-20 19:49 (p 1 of 2)
 Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

Batch ID:	04-9482-8364	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	08 Aug-19 00:01	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:		Species:	Glycine max	Brine:	
Test Length:	n/a	Taxon:		Source:	Age: V3
Sample ID:	19-1844-1015	Code:	51017506 glyveg	Project:	
Sample Date:	08 Aug-19	Material:	Glyphosate	Source:	Monsanto Company
Receipt Date:		CAS (PC):		Station:	
Sample Age:	1m	Client:	CDM Smith - K. Bozicevich		

128931 51017506; Soybean yield; Vegetative growth stage (V3)

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
01-0446-7652	Height	Dunnett Multiple Comparison Test	✓ 0.00039	0.00088	0.0005858		10.7%	1
18-3165-8018	Height	Williams Multiple Comparison Test	✓ 0.00039	0.00088	0.0005858		8.3%	1
07-7735-3669	Weight	Dunnett Multiple Comparison Test	0.0059	>0.0059	n/a		25.3%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
18-9768-7340	Height	NLR: 3P Cum Log-Normal (Probit)	IC5	0.000132	1.44E-05	0.000312		1
			IC10	0.000345	0.00016	0.0006		
			IC25	0.00171	0.00129	0.00223		
			✓ IC50	0.0102	0.006	0.0173		
00-2656-1961	Weight	NLR: 3P Cum Log-Normal (Probit)	IC50	0.0113	n/a	n/a		1

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	61.3	54.4	68.2	58.5	67.8	2.17	4.35	7.09%	0.00%
0.00039		4	57.9	50.5	65.4	51.7	62.9	2.35	4.69	8.10%	5.54%
0.00088		4	50.6	42.8	58.3	44.7	56.6	2.43	4.86	9.62%	17.57%
0.0012		4	47.2	45	49.5	45.3	48.6	0.711	1.42	3.01%	22.99%
0.0028		4	41.3	37.8	44.8	38.5	43.9	1.11	2.21	5.36%	32.65%
0.0059		4	37.5	30.8	44.2	32.9	43	2.11	4.22	11.24%	38.81%

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2400	1910	2880	2020	2700	152	303	12.67%	0.00%
0.00039		4	2660	1960	3360	2150	3210	221	442	16.61%	-10.99%
0.00088		4	2600	2170	3040	2380	2980	136	272	10.45%	-8.73%
0.0012		4	2820	2300	3350	2390	3120	165	330	11.69%	-17.82%
0.0028		4	2680	2010	3350	2250	3260	210	421	15.68%	-12.02%
0.0059		4	2490	1960	3020	2150	2800	167	334	13.44%	-3.84%

CETIS Summary ReportReport Date: 10 Apr-20 19:49 (p 2 of 2)
Test Code/ID: 51017506 glyveg / 19-9600-9866**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****MOARK Agricultural Research LLC****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	59.3	58.5	59.7	67.8
0.00039		57.6	51.7	59.5	62.9
0.00088		44.7	50.2	50.7	56.6
0.0012		47.9	45.3	47.1	48.6
0.0028		38.5	41.2	41.6	43.9
0.0059		32.9	36.2	43	38

Weight Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	2700	2570	2290	2020
0.00039		2750	2150	2520	3210
0.00088		2440	2980	2620	2380
0.0012		2750	3120	3030	2390
0.0028		2250	2610	2620	3260
0.0059		2150	2250	2750	2800

CETIS Analytical Report

Report Date: 10 Apr-20 19:43 (p 1 of 3)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	06-7854-9610	Endpoint:	Height	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:41	Analysis:	Parametric-Control vs Treatments	Status Level:	1			
Batch ID:	07-1814-7311	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	27 Aug-19 00:01	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:		Species:	Glycine max	Brine:				
Test Length:	n/a	Taxon:		Source:			Age: R1	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.002	0.0042	0.002898		11.75%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision($\alpha:5\%$)
Negative Control	0.00035	0.893	2.41	8.62	6	CDF	0.4697	Non-Significant Effect	
	0.0009	1.1	2.41	8.62	6	CDF	0.3804	Non-Significant Effect	
	0.002	2.05	2.41	8.62	6	CDF	0.0954	Non-Significant Effect	
	0.0042*	3.31	2.41	8.62	6	CDF	0.0080	Significant Effect	
	0.0086*	3.82	2.41	8.62	6	CDF	0.0027	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Between	564.16	112.832	5	4.4	0.0086	Significant Effect
Error	462.085	25.6714	18			
Total	1026.24		23			

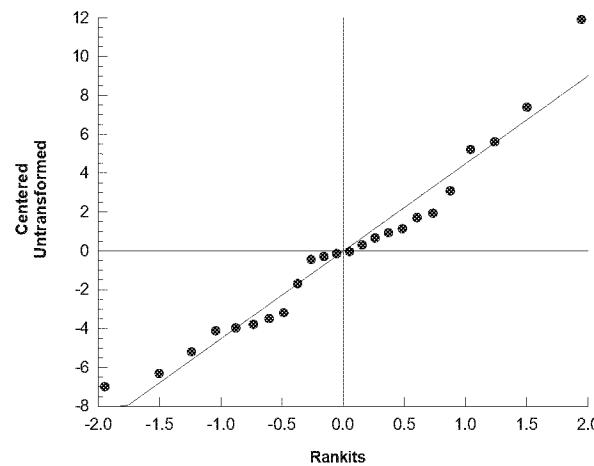
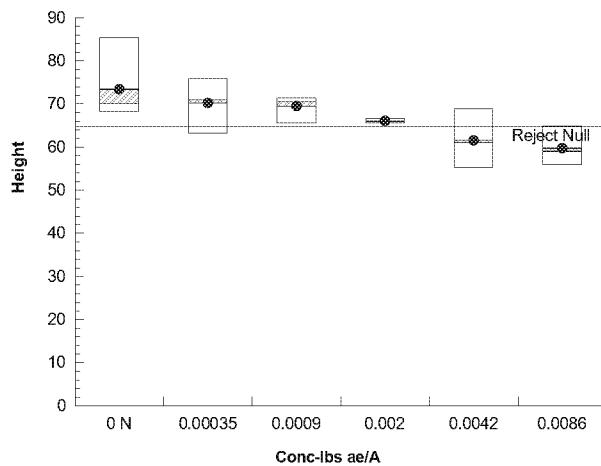
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision($\alpha:1\%$)
Variance	Bartlett Equality of Variance Test	13.7	15.1	0.0177	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.954	0.884	0.3305	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	73.4	60.7	86.1	70.1	68.2	85.3	3.99	10.87%	0.00%
0.00035		4	70.2	61.8	78.6	70.9	63.2	75.8	2.64	7.51%	4.36%
0.0009		4	69.5	65.2	73.7	70.5	65.5	71.4	1.34	3.86%	5.35%
0.002		4	66	65.3	66.8	65.9	65.6	66.7	0.233	0.70%	10.01%
0.0042		4	61.5	51.4	71.6	61	55.2	68.9	3.17	10.32%	16.18%
0.0086		4	59.7	53.6	65.8	59	55.9	64.9	1.92	6.45%	18.66%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:43 (p 2 of 3)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	13-7177-9167	Endpoint:	Height	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:42	Analysis:	Parametric-Control vs Ord.Treatments	Status Level:	1			
Batch ID:	07-1814-7311	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	27 Aug-19 00:01	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:		Species:	Glycine max	Brine:				
Test Length:	n/a	Taxon:		Source:			Age: R1	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0009	0.002	0.001342		9.11%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.00035	0.893	1.73	6.21	6	CDF	>0.05	Non-Significant Effect	
	0.0009	1.1	1.82	6.51	6	CDF	>0.05	Non-Significant Effect	
	0.002*	2.05	1.85	6.61	6	CDF	<0.05	Significant Effect	
	0.0042*	3.31	1.86	6.66	6	CDF	<0.05	Significant Effect	
	0.0086*	3.82	1.87	6.69	6	CDF	<0.05	Significant Effect	

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	564.16	112.832	5	4.4	0.0086	Significant Effect
Error	462.085	25.6714	18			
Total	1026.24		23			

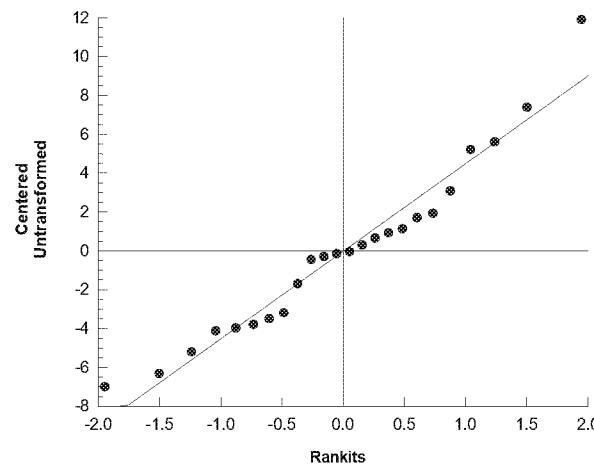
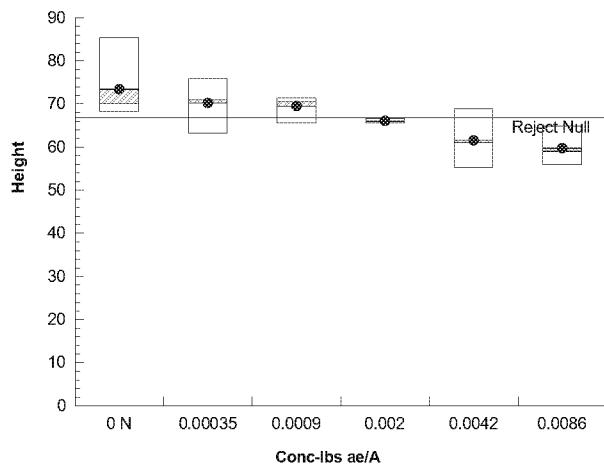
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	13.7	15.1	0.0177	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.954	0.884	0.3305	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	73.4	60.7	86.1	70.1	68.2	85.3	3.99	10.87%	0.00%
0.00035		4	70.2	61.8	78.6	70.9	63.2	75.8	2.64	7.51%	4.36%
0.0009		4	69.5	65.2	73.7	70.5	65.5	71.4	1.34	3.86%	5.35%
0.002		4	66	65.3	66.8	65.9	65.6	66.7	0.233	0.70%	10.01%
0.0042		4	61.5	51.4	71.6	61	55.2	68.9	3.17	10.32%	16.18%
0.0086		4	59.7	53.6	65.8	59	55.9	64.9	1.92	6.45%	18.66%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:43 (p 3 of 3)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	16-4417-7537	Endpoint:	Weight	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:41	Analysis:	Parametric-Control vs Treatments	Status Level:	1			
Batch ID:	07-1814-7311	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	27 Aug-19 00:01	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:		Species:	Glycine max	Brine:				
Test Length:	n/a	Taxon:		Source:		Age: R1		
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0086	>0.0086	n/a		21.76%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.00035		-0.179	2.41	633	6	CDF	0.8805	Non-Significant Effect
	0.0009		0.211	2.41	633	6	CDF	0.7638	Non-Significant Effect
	0.002		0.0883	2.41	633	6	CDF	0.8060	Non-Significant Effect
	0.0042		1.86	2.41	633	6	CDF	0.1323	Non-Significant Effect
	0.0086		2.12	2.41	633	6	CDF	0.0850	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	1446570	289314	5	2.09	0.1141	Non-Significant Effect
Error	2493300	138517	18			
Total	3939880		23			

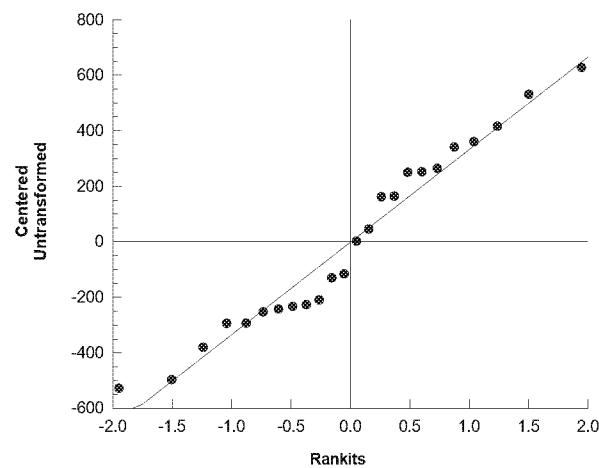
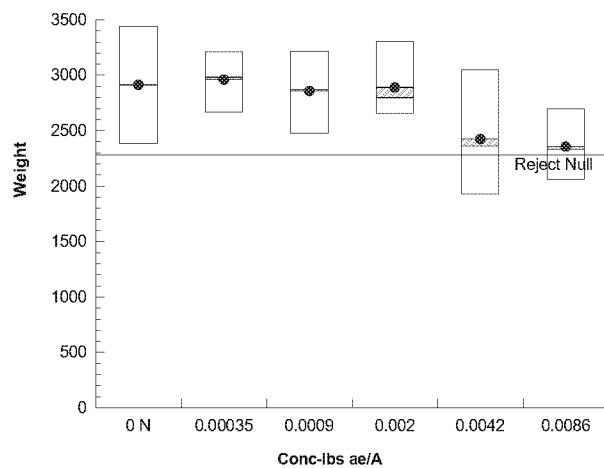
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	1.76	15.1	0.8809	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.954	0.884	0.3231	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	2910	2150	3670	2910	2380	3440	239	16.45%	0.00%
0.00035		4	2960	2560	3360	2980	2660	3210	125	8.48%	-1.61%
0.0009		4	2860	2270	3440	2870	2480	3220	183	12.84%	1.91%
0.002		4	2890	2400	3380	2800	2660	3300	153	10.59%	0.80%
0.0042		4	2420	1680	3170	2360	1920	3050	234	19.33%	16.79%
0.0086		4	2350	1870	2830	2330	2060	2700	151	12.83%	19.14%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:43 (p 1 of 4)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID: 03-2429-8007	Endpoint: Height			CETIS Version:	CETISv1.9.6		
Analyzed: 10 Apr-20 19:41	Analysis: Nonlinear Regression (NLR)			Status Level:	1		
Batch ID: 07-1814-7311	Test Type: Vegetative Vigor Tier II			Analyst:			
Start Date: 27 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:			
Ending Date:	Species: Glycine max			Brine:			
Test Length: n/a	Taxon:			Source:			
					Age: R1		

Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu=\alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [$\omega=1$]	Off [$\mu^*=\mu$]	None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
4	-36.3	79.9	82.2	0.4932	6.55%	73.5	Yes	0.166	0.9178	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.00053	4.29E-05	0.00158
IC10	0.00191	0.000811	0.00367
IC25	0.0163	0.00467	0.0445
IC50	0.176	0.00804	3.87

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	73.5	2.31	68.6	78.3	31.8	<1.0E-37	Significant Parameter
γ	3.53	1.36	0.71	6.35	2.6	0.0166	Significant Parameter
δ	0.176	0.223	-0.287	0.64	0.792	0.4372	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	107000	35800	3	1580	<1.0E-37	Significant Effect
Lack of Fit	12.8	4.26	3	0.166	0.9178	Non-Significant Effect
Pure Error	462	25.7	18			
Residual	475	22.6	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	13.7	11.1	0.0177	Unequal Variances
	Mod Levene Equality of Variance	1.01	2.77	0.4399	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.301	2.49	0.6083	Normal Distribution
	Shapiro-Wilk W Normality Test	0.967	0.917	0.5905	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	73.4	68.2	85.3	3.99	7.98	10.90%	0.0%
0.00035		4	70.2	63.2	75.8	2.64	5.27	7.51%	4.36%
0.0009		4	69.5	65.5	71.4	1.34	2.69	3.86%	5.35%
0.002		4	66	65.6	66.7	0.233	0.465	0.71%	10.0%
0.0042		4	61.5	55.2	68.9	3.17	6.35	10.30%	16.2%
0.0086		4	59.7	55.9	64.9	1.92	3.85	6.45%	18.7%

CETIS Analytical Report

Report Date: 10 Apr-20 19:43 (p 2 of 4)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

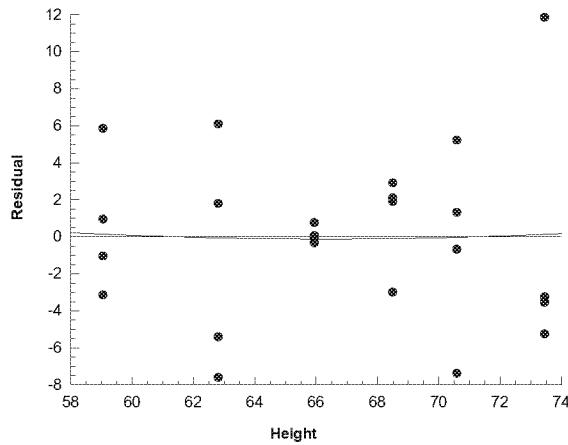
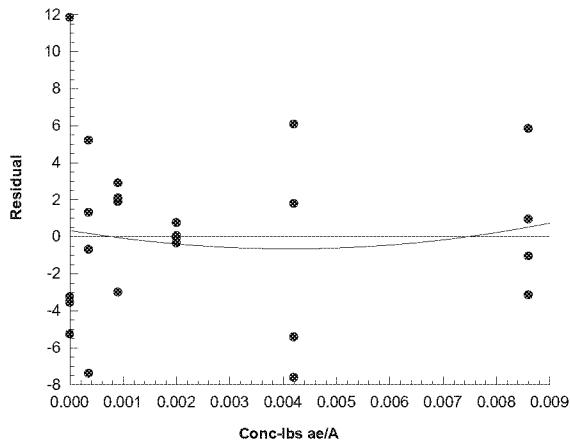
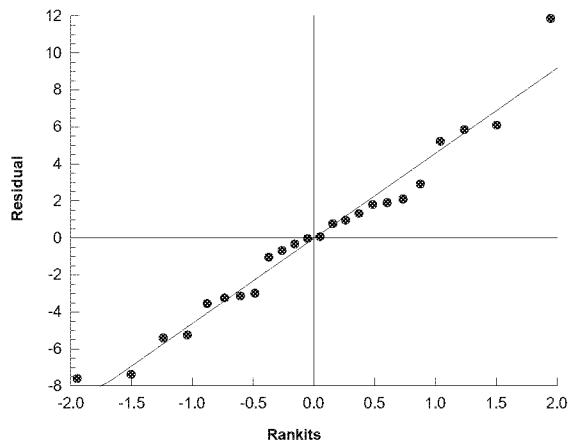
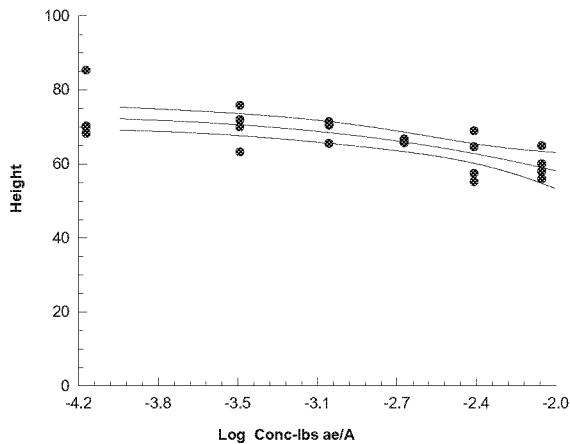
Analysis ID: 03-2429-8007
 Analyzed: 10 Apr-20 19:41

Endpoint: Height
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 10 Apr-20 19:43 (p 3 of 4)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID: 21-0974-7529	Endpoint: Weight			CETIS Version:	CETISv1.9.6		
Analyzed: 10 Apr-20 19:41	Analysis: Nonlinear Regression (NLR)			Status Level:	1		
Batch ID: 07-1814-7311	Test Type: Vegetative Vigor Tier II			Analyst:			
Start Date: 27 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:			
Ending Date:	Species: Glycine max			Brine:			
Test Length: n/a	Taxon:			Source:			
					Age: R1		

Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [$\omega=1$]	Off [$\mu^*=\mu$]	None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
14	-140	287	289	0.2569	10.08%	2950	Yes	0.433	0.7322	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.00157	n/a	0.00427
IC10	0.00317	0.000607	0.00663
IC25	0.0103	0.00313	0.0235
IC50	0.0382	n/a	n/a

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	2950	143	2650	3250	20.6	<1.0E-37	Significant Parameter
γ	1.94	1.31	-0.771	4.66	1.49	0.1515	Non-Significant Parameter
δ	0.0382	0.0429	-0.0509	0.127	0.892	0.3824	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	180000000	60100000	3	472	<1.0E-37	Significant Effect
Lack of Fit	180000	59900	3	0.433	0.7322	Non-Significant Effect
Pure Error	2490000	139000	18			
Residual	2670000	127000	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	1.76	11.1	0.8809	Equal Variances
	Mod Levene Equality of Variance	0.647	2.77	0.6674	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.538	2.49	0.1718	Normal Distribution
	Shapiro-Wilk W Normality Test	0.952	0.917	0.2939	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2910	2380	3440	239	479	16.50%	0.0%
0.00035		4	2960	2660	3210	125	251	8.48%	-1.61%
0.0009		4	2860	2480	3220	183	367	12.80%	1.91%
0.002		4	2890	2660	3300	153	306	10.60%	0.8%
0.0042		4	2420	1920	3050	234	468	19.30%	16.8%
0.0086		4	2350	2060	2700	151	302	12.80%	19.1%

CETIS Analytical Report

Report Date: 10 Apr-20 19:43 (p 4 of 4)
 Test Code/ID: 51017506 glyrep / 01-4248-4352

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

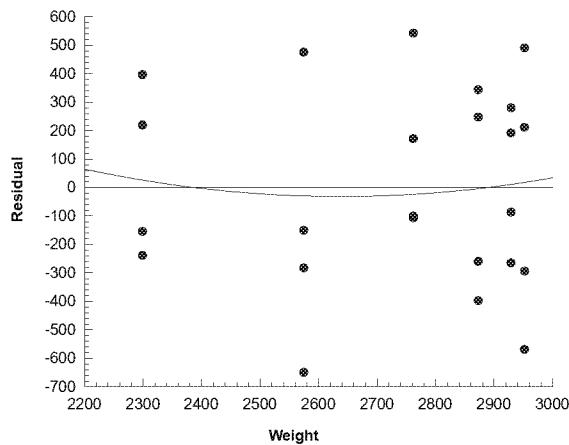
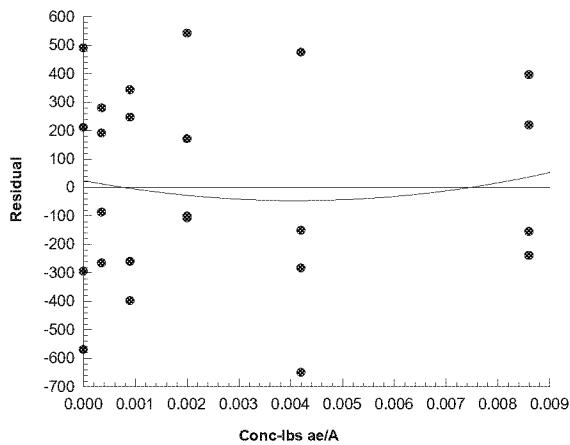
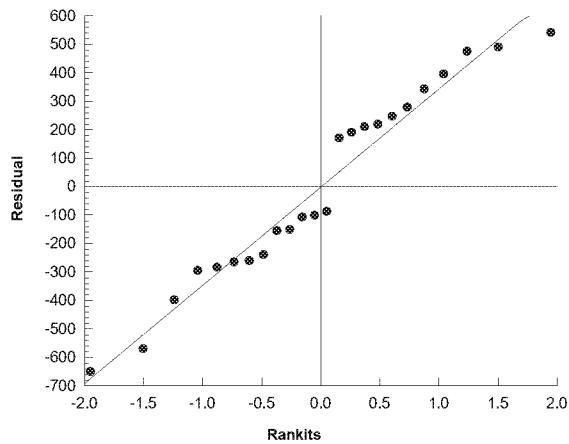
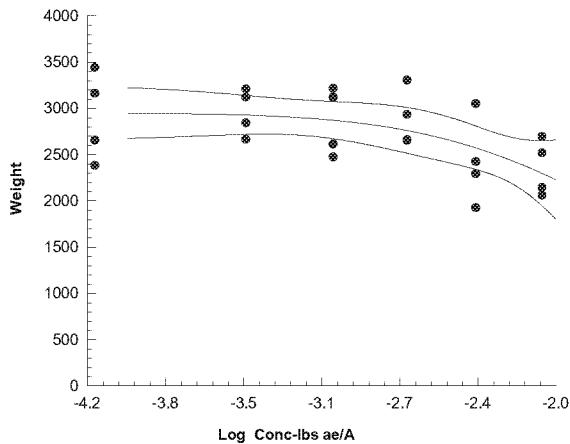
Analysis ID: 21-0974-7529
 Analyzed: 10 Apr-20 19:41

Endpoint: Weight
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 10 Apr-20 19:48 (p 1 of 3)
 Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	01-0446-7652	Endpoint:	Height	CETIS Version:	CETISv1.9.6			
Analyzed:	10 Apr-20 19:46	Analysis:	Parametric-Control vs Treatments	Status Level:	1			
Batch ID:	04-9482-8364	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	08 Aug-19 00:01	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:		Species:	Glycine max	Brine:				
Test Length:	n/a	Taxon:		Source:			Age: V3	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.00039	0.00088	0.0005858		10.71%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.00039		1.25	2.41	6.57	6	CDF	0.3186	Non-Significant Effect
	0.00088*		3.95	2.41	6.57	6	CDF	0.0020	Significant Effect
	0.0012*		5.17	2.41	6.57	6	CDF	1.7E-04	Significant Effect
	0.0028*		7.34	2.41	6.57	6	CDF	2.9E-05	Significant Effect
	0.0059*		8.73	2.41	6.57	6	CDF	2.7E-05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	1710.04	342.008	5	23	3.1E-07	Significant Effect
Error	267.82	14.8789	18			
Total	1977.86		23			

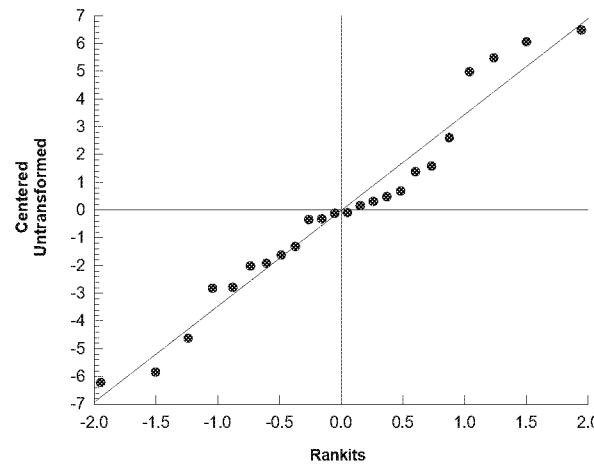
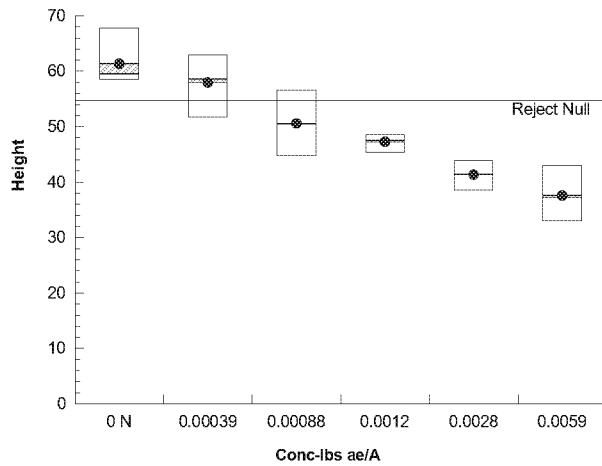
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	4.87	15.1	0.4320	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.956	0.884	0.3679	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	61.3	54.4	68.2	59.5	58.5	67.8	2.17	7.09%	0.00%
0.00039		4	57.9	50.5	65.4	58.5	51.7	62.9	2.35	8.10%	5.54%
0.00088		4	50.6	42.8	58.3	50.5	44.7	56.6	2.43	9.62%	17.57%
0.0012		4	47.2	45	49.5	47.5	45.3	48.6	0.711	3.01%	22.99%
0.0028		4	41.3	37.8	44.8	41.4	38.5	43.9	1.11	5.36%	32.65%
0.0059		4	37.5	30.8	44.2	37.1	32.9	43	2.11	11.24%	38.81%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:48 (p 2 of 3)
 Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC					
Analysis ID: 18-3165-8018	Endpoint: Height			CETIS Version: CETISv1.9.6					
Analyzed: 10 Apr-20 19:46	Analysis: Parametric-Control vs Ord.Treatments			Status Level: 1					
Batch ID: 04-9482-8364	Test Type: Vegetative Vigor Tier II			Analyst:					
Start Date: 08 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:					
Ending Date:	Species: Glycine max			Brine:					
Test Length: n/a	Taxon:			Source:					
Data Transform		Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed		C > T			0.00039	0.00088	0.0005858		8.30%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.00039		1.25	1.73	4.73	6	CDF	>0.05	Non-Significant Effect
	0.00088*		3.95	1.82	4.96	6	CDF	<0.05	Significant Effect
	0.0012*		5.17	1.85	5.03	6	CDF	<0.05	Significant Effect
	0.0028*		7.34	1.86	5.07	6	CDF	<0.05	Significant Effect
	0.0059*		8.73	1.87	5.09	6	CDF	<0.05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	1710.04	342.008	5	23	3.1E-07	Significant Effect
Error	267.82	14.8789	18			
Total	1977.86		23			

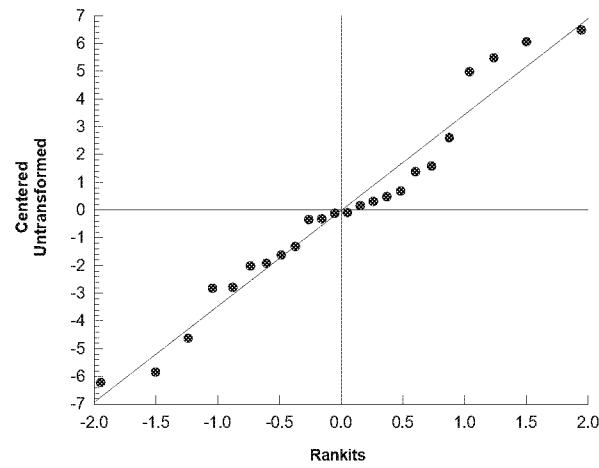
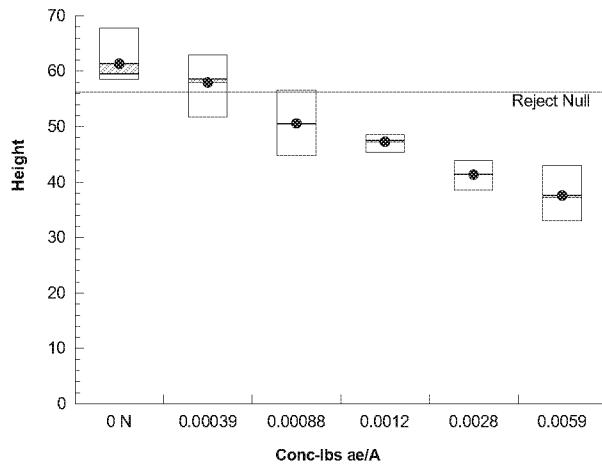
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	4.87	15.1	0.4320	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.956	0.884	0.3679	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	61.3	54.4	68.2	59.5	58.5	67.8	2.17	7.09%	0.00%
0.00039		4	57.9	50.5	65.4	58.5	51.7	62.9	2.35	8.10%	5.54%
0.00088		4	50.6	42.8	58.3	50.5	44.7	56.6	2.43	9.62%	17.57%
0.0012		4	47.2	45	49.5	47.5	45.3	48.6	0.711	3.01%	22.99%
0.0028		4	41.3	37.8	44.8	41.4	38.5	43.9	1.11	5.36%	32.65%
0.0059		4	37.5	30.8	44.2	37.1	32.9	43	2.11	11.24%	38.81%

Graphics



CETIS Analytical Report

Report Date: 10 Apr-20 19:48 (p 3 of 3)
 Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC				
Analysis ID:	07-7735-3669	Endpoint:	Weight	CETIS Version:	CETISv1.9.6	Status Level:	1	
Analyzed:	10 Apr-20 19:46	Analysis:	Parametric-Control vs Treatments					
Batch ID:	04-9482-8364	Test Type:	Vegetative Vigor Tier II			Analyst:		
Start Date:	08 Aug-19 00:01	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor			Diluent:		
Ending Date:		Species:	Glycine max			Brine:		
Test Length:	n/a	Taxon:				Source:	Age: V3	
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0059	>0.0059	n/a		25.27%

Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)
Negative Control	0.00039		-1.05	2.41	605	6	CDF	0.9848	Non-Significant Effect
	0.00088		-0.831	2.41	605	6	CDF	0.9730	Non-Significant Effect
	0.0012		-1.7	2.41	605	6	CDF	0.9977	Non-Significant Effect
	0.0028		-1.15	2.41	605	6	CDF	0.9884	Non-Significant Effect
	0.0059		-0.366	2.41	605	6	CDF	0.9187	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α :5%)
Between	455460	91092	5	0.72	0.6166	Non-Significant Effect
Error	2275980	126443	18			
Total	2731440		23			

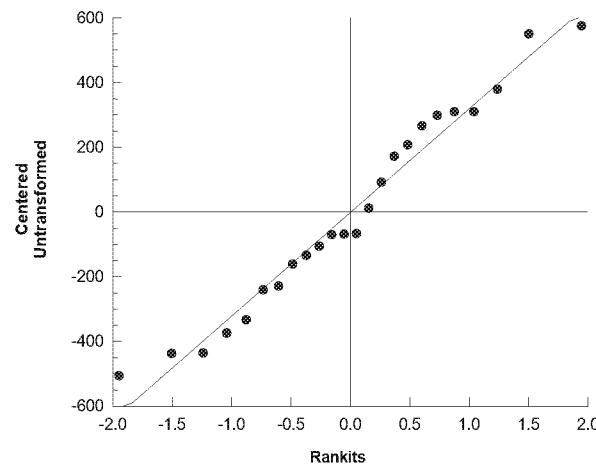
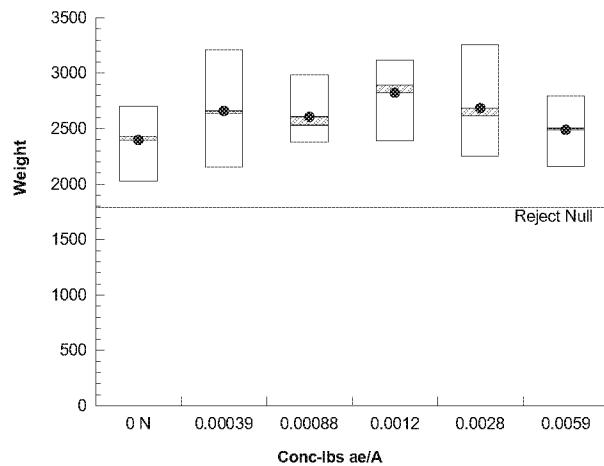
ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α :1%)
Variance	Bartlett Equality of Variance Test	0.947	15.1	0.9667	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.962	0.884	0.4715	Normal Distribution

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	2400	1910	2880	2430	2020	2700	152	12.67%	0.00%
0.00039		4	2660	1960	3360	2640	2150	3210	221	16.61%	-10.99%
0.00088		4	2600	2170	3040	2530	2380	2980	136	10.45%	-8.73%
0.0012		4	2820	2300	3350	2890	2390	3120	165	11.69%	-17.82%
0.0028		4	2680	2010	3350	2610	2250	3260	210	15.68%	-12.02%
0.0059		4	2490	1960	3020	2500	2150	2800	167	13.44%	-3.84%

Graphics



CETIS Analytical ReportReport Date: 10 Apr-20 19:48 (p 1 of 4)
Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID:	18-9768-7340	Endpoint:	Height	CETIS Version:	CETISv1.9.6		
Analyzed:	10 Apr-20 19:46	Analysis:	Nonlinear Regression (NLR)	Status Level:	1		
Batch ID:	04-9482-8364	Test Type:	Vegetative Vigor Tier II	Analyst:			
Start Date:	08 Aug-19 00:01	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:			
Ending Date:		Species:	Glycine max	Brine:			
Test Length:	n/a	Taxon:		Source:			
					Age: V3		

Non-Linear Regression Options

Model Name and Function				Weighting Function		PTBS Function		X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$				Normal [$\omega=1$]		Off [$\mu^*=\mu$]		None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
7	-31.9	70.9	73.2	0.8189	6.54%	61.9	Yes	1.33	0.2965	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.000132	1.44E-05	0.000312
IC10	0.000345	0.00016	0.0006
IC25	0.00171	0.00129	0.00223
IC50	0.0102	0.006	0.0173

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	61.9	1.95	57.9	66	31.8	<1.0E-37	Significant Parameter
γ	2.64	0.441	1.73	3.56	5.99	6.1E-06	Significant Parameter
δ	0.0102	0.00262	0.00474	0.0157	3.88	8.6E-04	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	60000	20000	3	1280	<1.0E-37	Significant Effect
Lack of Fit	59.3	19.8	3	1.33	0.2965	Non-Significant Effect
Pure Error	268	14.9	18			
Residual	327	15.6	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	4.87	11.1	0.4320	Equal Variances
	Mod Levene Equality of Variance	0.481	2.77	0.7856	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.708	2.49	0.0643	Normal Distribution
	Shapiro-Wilk W Normality Test	0.935	0.917	0.1286	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	
0	N	4	61.3	58.5	67.8	2.17	4.35	7.09%	0.0%
0.00039		4	57.9	51.7	62.9	2.35	4.69	8.10%	5.54%
0.00088		4	50.6	44.7	56.6	2.43	4.86	9.62%	17.6%
0.0012		4	47.2	45.3	48.6	0.711	1.42	3.01%	23.0%
0.0028		4	41.3	38.5	43.9	1.11	2.21	5.36%	32.7%
0.0059		4	37.5	32.9	43	2.11	4.22	11.20%	38.8%

CETIS Analytical Report

Report Date: 10 Apr-20 19:48 (p 2 of 4)
 Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

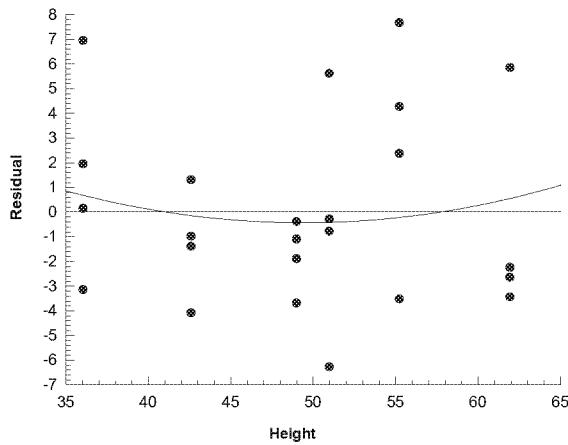
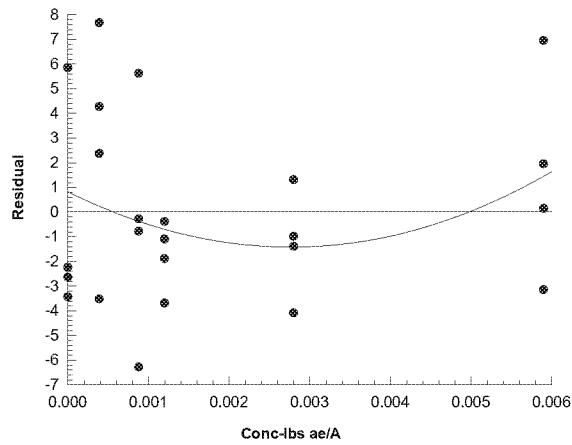
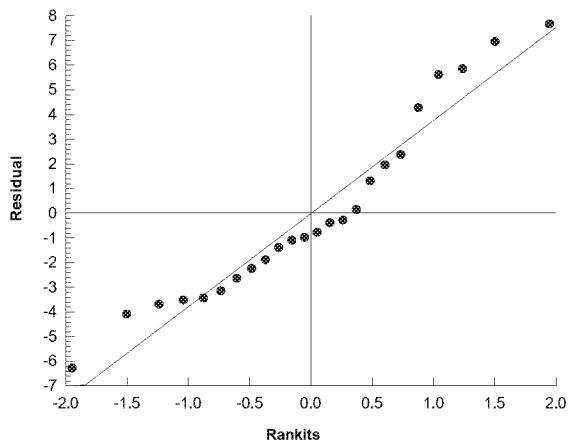
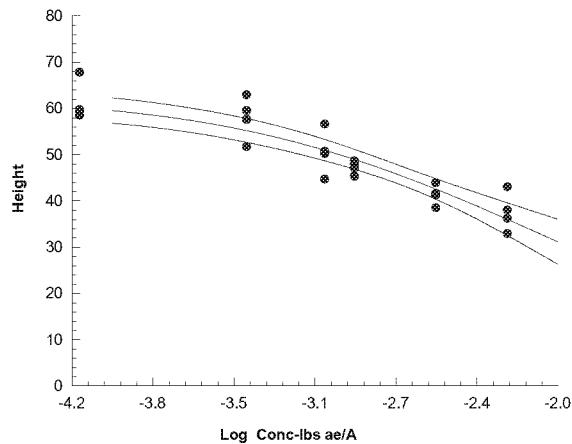
Analysis ID: 18-9768-7340
 Analyzed: 10 Apr-20 19:46

Endpoint: Height
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 10 Apr-20 19:48 (p 3 of 4)
 Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC			
Analysis ID: 00-2656-1961	Endpoint: Weight			CETIS Version:	CETISv1.9.6		
Analyzed: 10 Apr-20 19:46	Analysis: Nonlinear Regression (NLR)			Status Level:	1		
Batch ID: 04-9482-8364	Test Type: Vegetative Vigor Tier II			Analyst:			
Start Date: 08 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:			
Ending Date:	Species: Glycine max			Brine:			
Test Length: n/a	Taxon:			Source:			
					Age: V3		

Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [$\omega=1$]	Off [$\mu^*=\mu$]	None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
7	-174	355	357		63.38%	2400	Yes	112	0.0000	Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC50	0.0113	n/a	n/a

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	2400	730	877	3910	3.28	0.0036	Significant Parameter
γ	-2.5E+09	2.33E+18	-4.8E+18	4.84E+18	-1.1E-09	1.0000	Non-Significant Parameter
δ	0.0113	25800000	-5.4E+07	53700000	4.38E-10	1.0000	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Lack of Fit	42500000	14200000	3	112	<1.0E-37	Significant Effect
Model	121000000	40400000	3	19	3.5E-06	Significant Effect
Pure Error	2280000	126000	18			
Residual	44800000	2130000	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Mod Levene Equality of Variance	0.185	2.77	0.9647	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.978	2.49	0.0140	Non-Normal Distribution
	Shapiro-Wilk W Normality Test	0.9	0.917	0.0220	Non-Normal Distribution

Weight Summary

			Calculated Variate						
Conc-lbs ae/A	Code	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2400	2020	2700	152	303	12.70%	0.0%
0.00039		4	2660	2150	3210	221	442	16.60%	-11.0%
0.00088		4	2600	2380	2980	136	272	10.40%	-8.73%
0.0012		4	2820	2390	3120	165	330	11.70%	-17.8%
0.0028		4	2680	2250	3260	210	421	15.70%	-12.0%
0.0059		4	2490	2150	2800	167	334	13.40%	-3.84%

CETIS Analytical Report

Report Date: 10 Apr-20 19:48 (p 4 of 4)
 Test Code/ID: 51017506 glyveg / 19-9600-9866

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

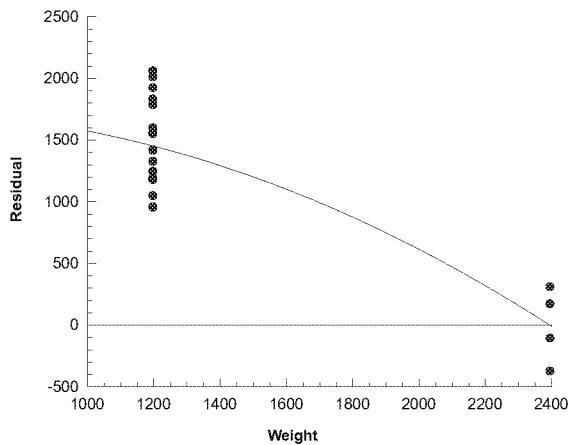
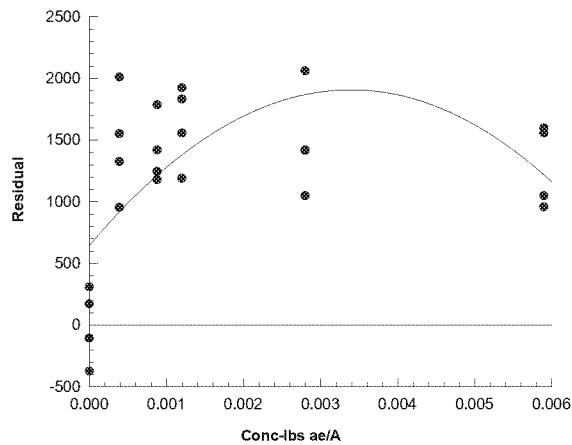
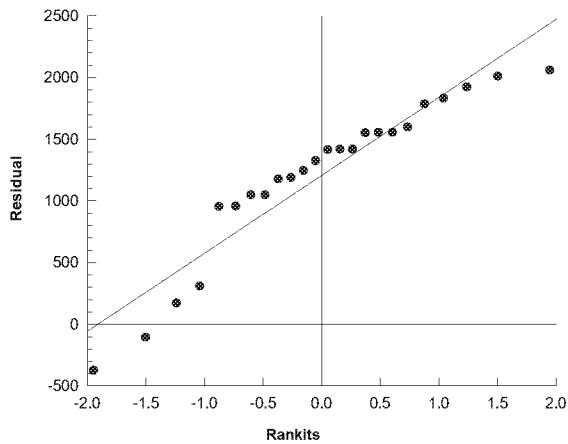
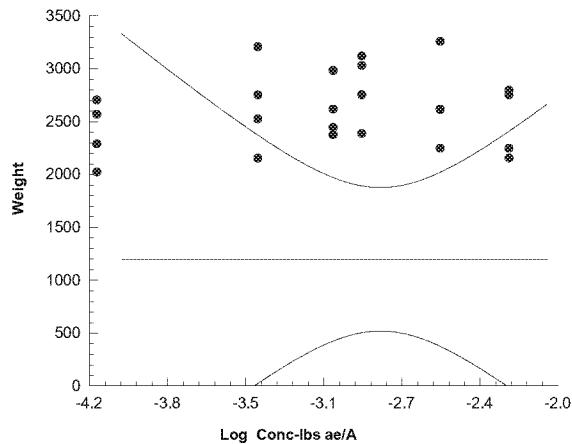
Analysis ID: 00-2656-1961
 Analyzed: 10 Apr-20 19:46

Endpoint: Weight
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.6
 Status Level: 1

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 27 May-20 00:27 (p 1 of 2)
 Test Code/ID: 51017506 Gr14 / 17-9816-9468

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)							MOARK Agricultural Research LLC					
Analysis ID: 11-5289-8330	Endpoint: Height					CETIS Version: CETISv1.9.6						
Analyzed: 26 May-20 21:19	Analysis: Parametric-Control vs Ord.Treatments					Status Level: 1						
Batch ID: 14-7288-8047	Test Type: Vegetative Vigor Tier II					Analyst:						
Start Date: 27 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor					Diluent:						
Ending Date: 26 May-20 21:04	Species: Glycine max					Brine:						
Test Length: 273d 21h	Taxon:					Source:						
Sample ID: 00-4027-7160	Code: 26694A8					Age:						
Sample Date: 27 Aug-19	Material: Glyphosate					Project:						
Receipt Date: 26 May-20 21:04	CAS (PC):					Source: Monsanto Company						
Sample Age: 1m	Client: CDM Smith - K. Bozicevich					Station:						
Data Transform	Alt Hyp				NOEL		LOEL	TOEL	TU	PMSD		
Untransformed	C > T				0.002		0.0042	0.002898	9.06%			
Williams Multiple Comparison Test												
Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α :5%)			
Negative Control	0.00035	-0.3149	1.734	5.644	6	CDF	>0.05	Non-Significant Effect				
	0.0009	0.2304	1.818	5.917	6	CDF	>0.05	Non-Significant Effect				
	0.002	0.722	1.845	6.005	6	CDF	>0.05	Non-Significant Effect				
	0.0042*	2.458	1.859	6.05	6	CDF	<0.05	Significant Effect				
	0.0086*	2.896	1.867	6.076	6	CDF	<0.05	Significant Effect				
ANOVA Table												
Source	Sum Squares		Mean Square		DF	F Stat		P-Value	Decision(α :5%)			
Between	386.365		77.273		5	3.647		0.0187	Significant Effect			
Error	381.335		21.1853		18							
Total	767.7				23							
ANOVA Assumptions Tests												
Attribute	Test			Test Stat		Critical	P-Value		Decision(α :1%)			
Variance	Bartlett Equality of Variance Test			6.345		15.09	0.2741		Equal Variances			
Distribution	Shapiro-Wilk W Normality Test			0.9686		0.884	0.6327		Normal Distribution			
Height Summary												
Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
0	N	4	67.05	60.31	73.79	65.75	63.5	73.2	2.118	6.32%	0.00%	
0.00035		4	68.07	62.64	73.51	68.4	64	71.5	1.708	5.02%	-1.53%	
0.0009		4	66.3	60.92	71.68	66.7	61.8	70	1.69	5.10%	1.12%	
0.002		4	64.7	62.09	67.31	64.85	62.7	66.4	0.8195	2.53%	3.50%	
0.0042		4	59.05	46.43	71.67	57.6	51.6	69.4	3.965	13.43%	11.93%	
0.0086		4	57.62	50.42	64.83	56.15	54	64.2	2.265	7.86%	14.06%	
Height Detail												
Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4							
0	N	65.8	65.7	73.2	63.5							
0.00035		71.5	64	66.6	70.2							
0.0009		66.7	70	66.7	61.8							
0.002		66.4	62.7	64.1	65.6							
0.0042		60.9	51.6	54.3	69.4							
0.0086		56.8	64.2	55.5	54							

CETIS Analytical Report

Report Date: 27 May-20 00:27 (p 2 of 2)
Test Code/ID: 51017506 Gr14 / 17-9816-9468

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

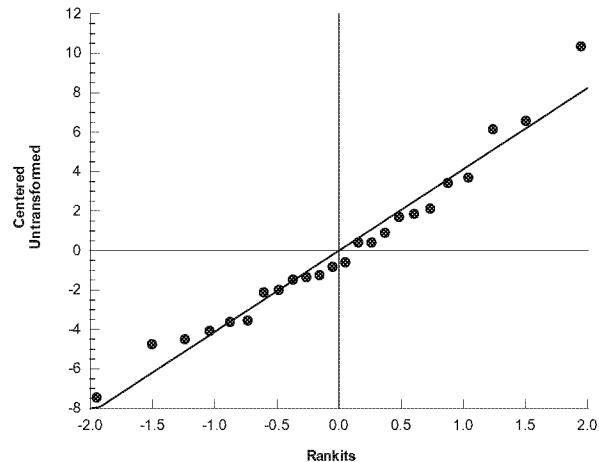
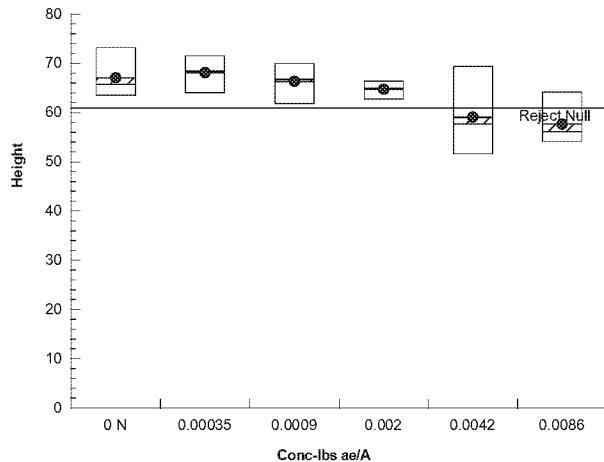
MOARK Agricultural Research LLC

Analysis ID: 11-5289-8330
Analyzed: 26 May-20 21:19

Endpoint: Height
Analysis: Parametric-Control vs Ord.Treatments

CETIS Version: CETISv1.9.6
Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 27 May-20 00:27 (p 1 of 2)
 Test Code/ID: 51017506 Gr14 / 17-9816-9468

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Analysis ID: 17-8496-8228	Endpoint: Height	CETIS Version: CETISv1.9.6			
Analyzed: 26 May-20 21:19	Analysis: Nonlinear Regression (NLR)	Status Level: 1			
Batch ID: 14-7288-8047	Test Type: Vegetative Vigor Tier II	Analyst:			
Start Date: 27 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor	Diluent:			
Ending Date: 26 May-20 21:04	Species: Glycine max	Brine:			
Test Length: 273d 21h	Taxon:	Source:			Age:
Sample ID: 00-4027-7160	Code: 26694A8	Project:			
Sample Date: 27 Aug-19	Material: Glyphosate	Source: Monsanto Company			
Receipt Date: 26 May-20 21:04	CAS (PC):	Station:			
Sample Age: 1m	Client: CDM Smith - K. Bozicevich				

Non-Linear Regression Options

Model Name and Function		Weighting Function		PTBS Function		X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$		Normal [$\omega=1$]		Off [$\mu^*=\mu$]		None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
22	-34.51	76.23	78.56	0.4177	5.87%	67.91	Yes	0.4218	0.7396	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.001693	0.0002494	0.003681
IC10	0.004096	0.002108	0.006681
IC15	0.007433	0.003915	0.01228
IC20	0.01194	0.004425	0.02481
IC25	0.01792	0.004232	0.04916
IC40	0.04991	0.002896	0.389
IC50	0.09241	0.002637	3.238

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	67.91	1.916	63.92	71.89	35.45	<1.0E-37	Significant Parameter
γ	2.432	1.185	-0.03311	4.896	2.052	0.0529	Non-Significant Parameter
δ	0.09241	0.1119	-0.1403	0.3251	0.8259	0.4182	Non-Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	98050	32680	3	1682	<1.0E-37	Significant Effect
Lack of Fit	26.81	8.935	3	0.4218	0.7396	Non-Significant Effect
Pure Error	381.3	21.19	18			
Residual	408.1	19.44	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	6.345	11.07	0.2741	Equal Variances
	Mod Levene Equality of Variance	1.354	2.773	0.2873	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.1684	2.492	0.9883	Normal Distribution
	Shapiro-Wilk W Normality Test	0.9889	0.9169	0.9930	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	67.05	63.5	73.2	2.118	4.235	6.32%	0.0%
0.00035		4	68.07	64	71.5	1.708	3.417	5.02%	-1.53%
0.0009		4	66.3	61.8	70	1.69	3.379	5.10%	1.12%
0.002		4	64.7	62.7	66.4	0.8195	1.639	2.53%	3.51%
0.0042		4	59.05	51.6	69.4	3.965	7.929	13.43%	11.93%
0.0086		4	57.62	54	64.2	2.265	4.53	7.86%	14.06%

CETIS Analytical Report

Report Date: 27 May-20 00:27 (p 2 of 2)
 Test Code/ID: 51017506 Gr14 / 17-9816-9468

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

Analysis ID: 17-8496-8228
 Analyzed: 26 May-20 21:19

Endpoint: Height
 Analysis: Nonlinear Regression (NLR)

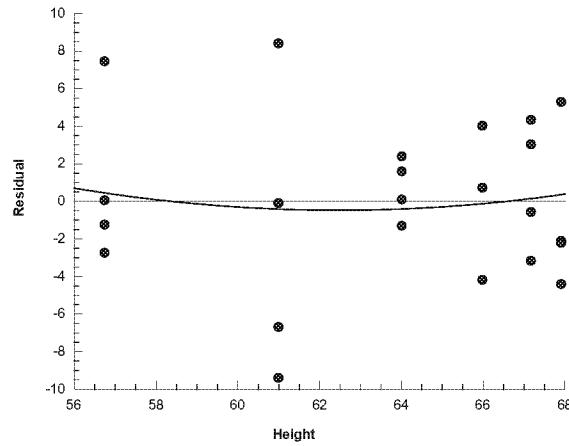
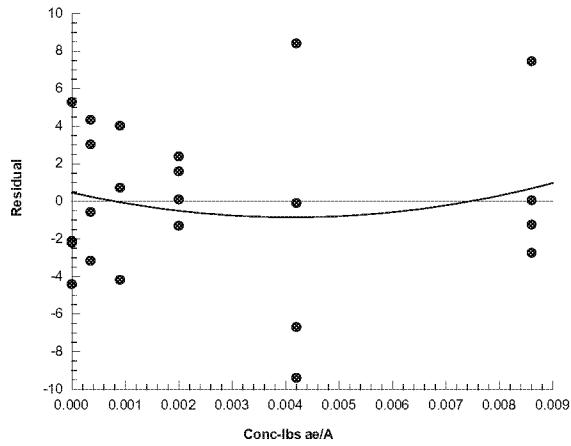
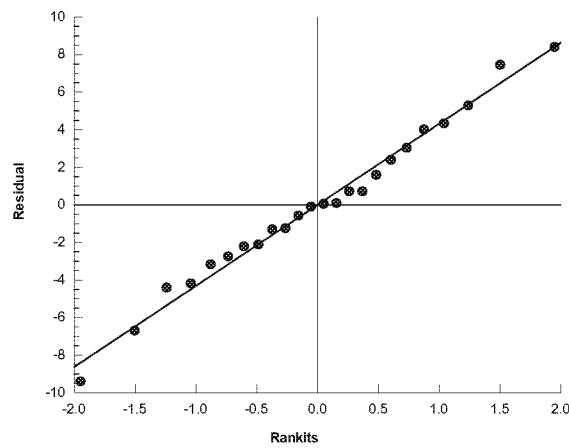
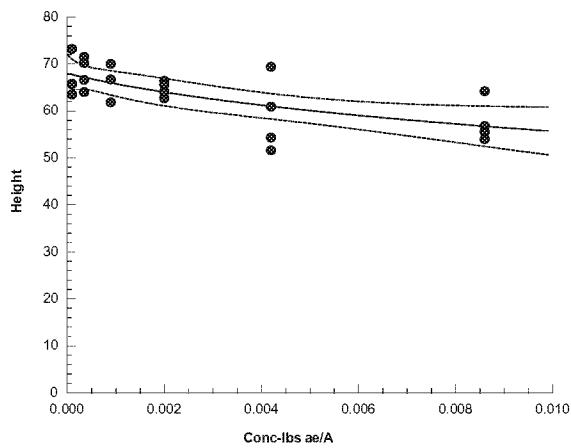
CETIS Version: CETISv1.9.6
 Status Level: 1

Height Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	65.8	65.7	73.2	63.5
0.00035		71.5	64	66.6	70.2
0.0009		66.7	70	66.7	61.8
0.002		66.4	62.7	64.1	65.6
0.0042		60.9	51.6	54.3	69.4
0.0086		56.8	64.2	55.5	54

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 1 of 2)
 Test Code/ID: 51017506 GV14 / 15-8221-1110

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Analysis ID: 11-6514-4969	Endpoint: Height				CETIS Version: CETISv1.9.6
Analyzed: 26 May-20 21:22	Analysis: Parametric-Control vs Ord.Treatments				Status Level: 1
Batch ID: 15-2382-6765	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 08 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 26 May-20 21:03	Species: Glycine max				Brine:
Test Length: 292d 21h	Taxon:				Source: Age:
Sample ID: 18-4723-3040	Code: 6E1A8A10				Project:
Sample Date: 08 Aug-19	Material: Glyphosate				Source: Monsanto Company
Receipt Date: 26 May-20 21:03	CAS (PC):				Station:
Sample Age: 1m	Client: CDM Smith - K. Bozicevich				

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.00088	0.0012	0.001028		8.54%

Williams Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision($\alpha:5\%$)
Negative Control		0.00039	-0.1075	1.734	2.42	6	CDF	>0.05	Non-Significant Effect
		0.00088	1.72	1.818	2.537	6	CDF	>0.05	Non-Significant Effect
		0.0012*	3.278	1.845	2.575	6	CDF	<0.05	Significant Effect
		0.0028*	7.184	1.859	2.594	6	CDF	<0.05	Significant Effect
		0.0059*	8.903	1.867	2.605	6	CDF	<0.05	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Between	555.027	111.005	5	28.5	<1.0E-37	Significant Effect
Error	70.1125	3.89514	18			
Total	625.14		23			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision($\alpha:1\%$)
Variance	Bartlett Equality of Variance Test	11.87	15.09	0.0367	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9709	0.884	0.6899	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	30.5	25.53	35.47	30.45	27.1	34	1.562	10.24%	0.00%
0.00039		4	30.65	26.62	34.68	31.55	27	32.5	1.265	8.26%	-0.49%
0.00088		4	28.1	24.84	31.36	27.75	26	30.9	1.026	7.30%	7.87%
0.0012		4	25.93	23.57	28.28	26.35	23.8	27.2	0.7387	5.70%	15.00%
0.0028		4	20.47	19.12	21.83	20.2	19.8	21.7	0.427	4.17%	32.87%
0.0059		4	18.07	17.58	18.57	18	17.8	18.5	0.1548	1.71%	40.74%

Height Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	32.1	28.8	27.1	34
0.00039		30.9	27	32.5	32.2
0.00088		26	28	27.5	30.9
0.0012		26.5	26.2	27.2	23.8
0.0028		20	20.4	19.8	21.7
0.0059		18.1	18.5	17.9	17.8

CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 2 of 2)
Test Code/ID: 51017506 GV14 / 15-8221-1110

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

Analysis ID: 11-6514-4969

Endpoint: Height

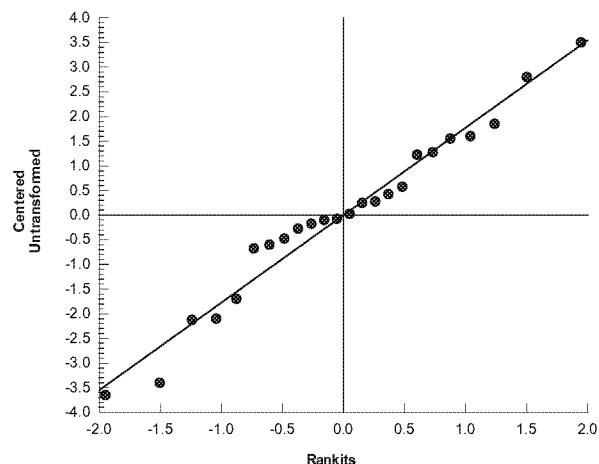
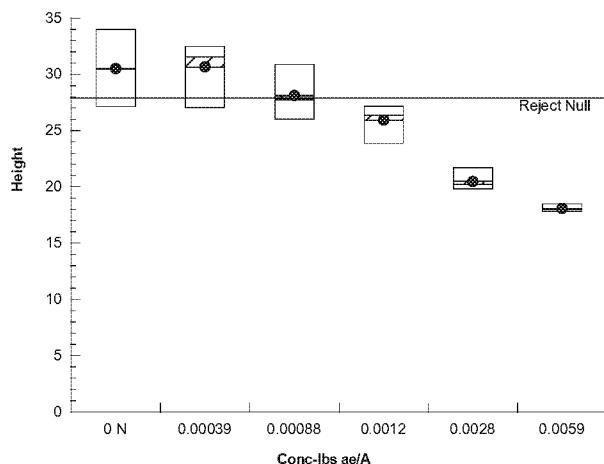
Analyzed: 26 May-20 21:22

Analysis: Parametric-Control vs Ord.Treatments

CETIS Version: CETISv1.9.6

Status Level: 1

Graphics



CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 1 of 2)
 Test Code/ID: 51017506 GV14 / 15-8221-1110

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Analysis ID: 19-7887-1149	Endpoint: Height				CETIS Version: CETISv1.9.6
Analyzed: 26 May-20 21:23	Analysis: Nonlinear Regression (NLR)				Status Level: 1
Batch ID: 15-2382-6765	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 08 Aug-19 00:01	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 26 May-20 21:03	Species: Glycine max				Brine:
Test Length: 292d 21h	Taxon:				Source: Age:
Sample ID: 18-4723-3040	Code: 6E1A8A10				Project:
Sample Date: 08 Aug-19	Material: Glyphosate				Source: Monsanto Company
Receipt Date: 26 May-20 21:03	CAS (PC):				Station:
Sample Age: 1m	Client: CDM Smith - K. Bozicevich				

Non-Linear Regression Options

Model Name and Function		Weighting Function		PTBS Function		X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$		Normal [$\omega=1$]		Off [$\mu^*=\mu$]		None	None

Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSD	Thresh	Optimize	F Stat	P-Value	Decision($\alpha:5\%$)
15	-16.53	40.26	42.59	0.8402	6.49%	31.19	Yes	1.804	0.1825	Non-Sig Lack of Fit

Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.000383	0.000124	0.0006503
IC10	0.0007358	0.0004515	0.001055
IC15	0.001143	0.000805	0.001529
IC20	0.001622	0.001232	0.00207
IC25	0.002191	0.001738	0.00271
IC40	0.004669	0.003646	0.00593
IC50	0.007362	0.005274	0.01028

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision($\alpha:5\%$)
α	31.19	0.9731	29.16	33.21	32.05	<1.0E-37	Significant Parameter
γ	1.797	0.2935	1.187	2.408	6.123	4.5E-06	Significant Parameter
δ	0.007362	0.001183	0.004902	0.009822	6.224	3.6E-06	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision($\alpha:5\%$)
Model	16290	5429	3	1250	<1.0E-37	Significant Effect
Lack of Fit	21.08	7.028	3	1.804	0.1825	Non-Significant Effect
Pure Error	70.11	3.895	18			
Residual	91.2	4.343	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision($\alpha:5\%$)
Variance	Bartlett Equality of Variance Test	11.87	11.07	0.0367	Unequal Variances
	Mod Levene Equality of Variance	2.014	2.773	0.1252	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.4509	2.492	0.2790	Normal Distribution
	Shapiro-Wilk W Normality Test	0.9611	0.9169	0.4607	Normal Distribution

Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	30.5	27.1	34	1.562	3.123	10.24%	0.0%
0.00039		4	30.65	27	32.5	1.265	2.53	8.26%	-0.49%
0.00088		4	28.1	26	30.9	1.026	2.051	7.30%	7.87%
0.0012		4	25.93	23.8	27.2	0.7387	1.477	5.70%	15.0%
0.0028		4	20.47	19.8	21.7	0.427	0.8539	4.17%	32.87%
0.0059		4	18.07	17.8	18.5	0.1548	0.3096	1.71%	40.74%

CETIS Analytical Report

Report Date: 27 May-20 00:29 (p 2 of 2)
 Test Code/ID: 51017506 GV14 / 15-8221-1110

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

MOARK Agricultural Research LLC

Analysis ID: 19-7887-1149 Endpoint: Height
 Analyzed: 26 May-20 21:23 Analysis: Nonlinear Regression (NLR)

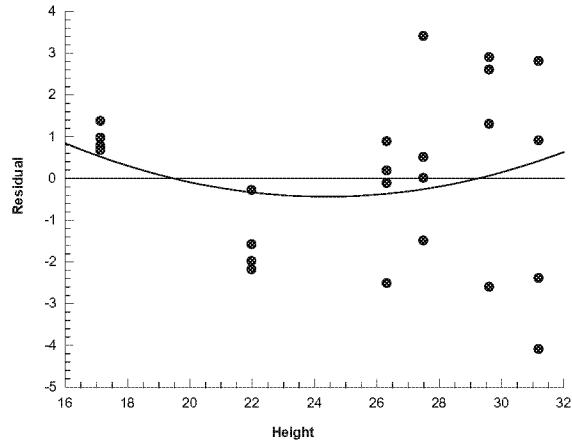
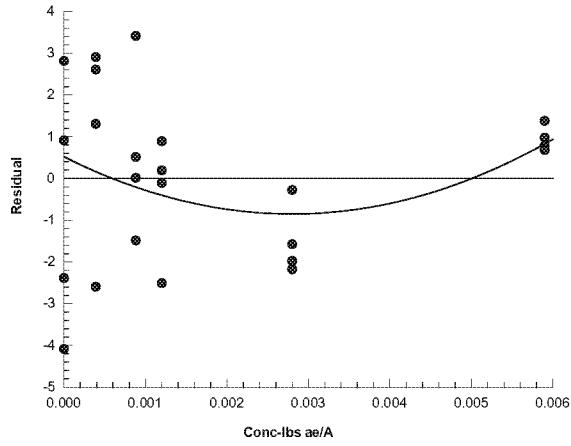
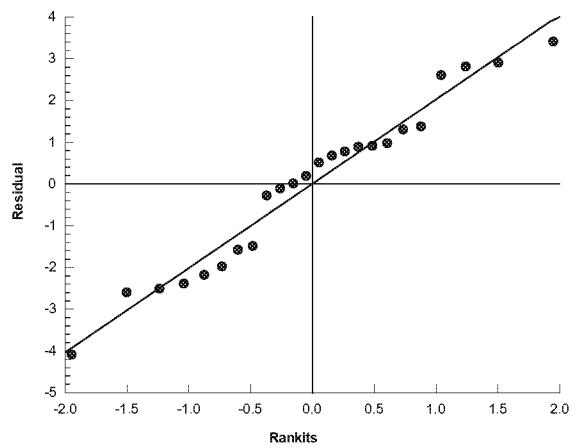
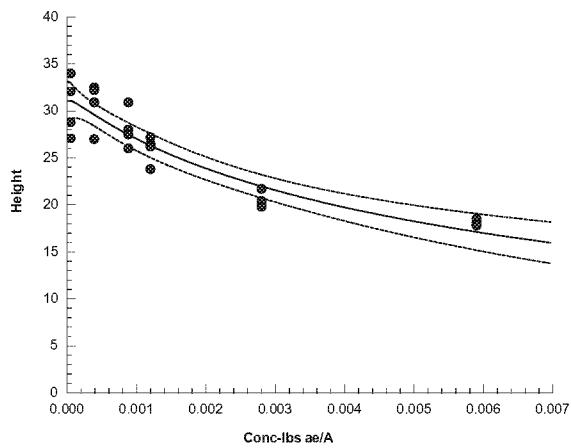
CETIS Version: CETISv1.9.6
 Status Level: 1

Height Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	32.1	28.8	27.1	34
0.00039		30.9	27	32.5	32.2
0.00088		26	28	27.5	30.9
0.0012		26.5	26.2	27.2	23.8
0.0028		20	20.4	19.8	21.7
0.0059		18.1	18.5	17.9	17.8

Graphics

Model: 3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$ Distribution: Normal [$\omega=1$]



CETIS Summary Report

Report Date: 10 Apr-20 19:30 (p 1 of 2)
 Test Code/ID: 51017506 direpr / 04-5899-6442

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Batch ID: 18-3183-0242	Test Type: Vegetative Vigor Tier II		Analyst:		
Start Date: 27 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor		Diluent:		
Ending Date:	Species: Glycine max		Brine:		
Test Length: n/a	Taxon:		Source:		Age: R1
Sample ID: 08-2000-5254	Code: 51017506 direpr		Project:		
Sample Date: 27 Aug-19	Material: Dicamba DGA		Source: Monsanto Company		
Receipt Date:	CAS (PC):		Station:		
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

128931 51017506; Soybean yield; Reproductive stage (R1)

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
06-1688-2755	Height	Dunnett Multiple Comparison Test	0.0016	0.0032	0.002263		11.7%	1
06-3821-1704	Height	Williams Multiple Comparison Test	✓ 0.00064	0.0016	0.001012		9.11%	1
05-4717-3686	Weight	Dunnett Multiple Comparison Test	0.0048	>0.0048	n/a		21.8%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
17-0789-3913	Height	NLR: 3P Cum Log-Normal (Probit)	✓ IC5	0.000565	8.29E-05	0.00132		1
			✓ IC10	0.00154	0.000787	0.00256		
			IC25	0.00823	0.00317	0.0178		
			IC50	0.053	0.00489	0.574		
10-1274-3680	Weight	NLR: 3P Cum Log-Normal (Probit)	IC5	0.00159	n/a	0.00338		1
			IC10	0.00254	0.000431	0.00439		
			✓ IC25	0.00554	0.00235	0.00985		
			✓ IC50	0.0132	n/a	n/a		

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	73.4	60.7	86.1	68.2	85.3	3.99	7.98	10.87%	0.00%
0.0005		4	70.2	61.8	78.6	63.2	75.8	2.64	5.27	7.51%	4.36%
0.00064		4	69.5	65.2	73.7	65.5	71.4	1.34	2.68	3.86%	5.35%
0.0016		4	66.1	65.3	66.8	65.6	66.7	0.233	0.465	0.70%	10.01%
0.0032		4	61.5	51.4	71.6	55.2	68.9	3.17	6.35	10.32%	16.18%
0.0048		4	59.7	53.6	65.8	55.9	64.9	1.92	3.85	6.45%	18.66%

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2910	2150	3670	2380	3440	239	479	16.45%	0.00%
0.0005		4	2960	2560	3360	2660	3210	125	251	8.48%	-1.61%
0.00064		4	2860	2270	3440	2480	3220	183	367	12.84%	1.91%
0.0016		4	2890	2400	3380	2660	3300	153	306	10.59%	0.80%
0.0032		4	2420	1680	3170	1920	3050	234	468	19.33%	16.79%
0.0048		4	2350	1870	2830	2060	2700	151	302	12.83%	19.14%

CETIS Summary ReportReport Date: 10 Apr-20 19:30 (p 2 of 2)
Test Code/ID: 51017506 direpr / 04-5899-6442**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****MOARK Agricultural Research LLC****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	70.2	68.2	85.3	69.9
0.0005		71.9	63.2	69.9	75.8
0.00064		71.4	70.4	70.6	65.5
0.0016		66.7	65.9	65.6	66
0.0032		64.6	57.4	55.2	68.9
0.0048		58	64.9	55.9	60

Weight Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	3160	2660	3440	2380
0.0005		3210	2660	2840	3120
0.00064		3120	3220	2480	2610
0.0016		3300	2660	2930	2660
0.0032		3050	2290	1920	2420
0.0048		2520	2700	2060	2140

CETIS Summary Report

Report Date: 10 Apr-20 19:35 (p 1 of 2)
 Test Code/ID: 51017506 diveg / 15-1861-5389

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				MOARK Agricultural Research LLC	
Batch ID: 18-9894-5861	Test Type: Vegetative Vigor Tier II		Analyst:		
Start Date: 08 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor		Diluent:		
Ending Date:	Species: Glycine max		Brine:		
Test Length: n/a	Taxon:		Source:		Age: V3
Sample ID: 13-8122-7732	Code: 51017506 diveg		Project:		
Sample Date: 08 Aug-19	Material: Dicamba DGA		Source: Monsanto Company		
Receipt Date:	CAS (PC):		Station:		
Sample Age: n/a	Client: CDM Smith - K. Bozicevich				

128931 51017506; Soybean yield; Vegetative growth stage (V3)

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
08-2166-4582	Height	Dunnett Multiple Comparison Test	✓ 0.00035	0.00081	0.0005324		10.7%	1
05-5712-5004	Height	Williams Multiple Comparison Test	✓ 0.00035	0.00081	0.0005324		8.3%	1
20-0290-9377	Weight	Dunnett Multiple Comparison Test	0.0087	>0.0087	n/a		25.3%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
19-1272-0336	Height	NLR: 3P Cum Log-Normal (Probit)	IC5	0.0000996	6.73E-06	0.000275		1
			IC10	0.000306	0.000123	0.000592		
			IC25	0.002	0.00143	0.00274		
			IC50	0.0162	0.00859	0.0304		
03-2092-6100	Weight	NLR: 3P Cum Log-Normal (Probit)	✓ IC5	0.0000082	n/a	n/a		1
			✓ IC10	0.0000070	n/a	n/a		
			✓ IC25	0.0000054	n/a	n/a		
			✓ IC50	0.0000040	n/a	n/a		

Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	61.3	54.4	68.2	58.5	67.8	2.17	4.35	7.09%	0.00%
0.00035		4	57.9	50.5	65.4	51.7	62.9	2.35	4.69	8.10%	5.54%
0.00081		4	50.6	42.8	58.3	44.7	56.6	2.43	4.86	9.62%	17.57%
0.0017		4	47.2	45	49.5	45.3	48.6	0.711	1.42	3.01%	22.99%
0.0031		4	41.3	37.8	44.8	38.5	43.9	1.11	2.21	5.36%	32.65%
0.0087		4	37.5	30.8	44.2	32.9	43	2.11	4.22	11.24%	38.81%

Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	2400	1910	2880	2020	2700	152	303	12.67%	0.00%
0.00035		4	2660	1960	3360	2150	3210	221	442	16.61%	-10.99%
0.00081		4	2600	2170	3040	2380	2980	136	272	10.45%	-8.73%
0.0017		4	2820	2300	3350	2390	3120	165	330	11.69%	-17.82%
0.0031		4	2680	2010	3350	2250	3260	210	421	15.68%	-12.02%
0.0087		4	2490	1960	3020	2150	2800	167	334	13.44%	-3.84%

CETIS Summary ReportReport Date: 10 Apr-20 19:35 (p 2 of 2)
Test Code/ID: 51017506 diveg / 15-1861-5389**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****MOARK Agricultural Research LLC****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	59.3	58.5	59.7	67.8
0.00035		57.6	51.7	59.5	62.9
0.00081		44.7	50.2	50.7	56.6
0.0017		47.9	45.3	47.1	48.6
0.0031		38.5	41.2	41.6	43.9
0.0087		32.9	36.2	43	38

Weight Detail

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	2700	2570	2290	2020
0.00035		2750	2150	2520	3210
0.00081		2440	2980	2620	2380
0.0017		2750	3120	3030	2390
0.0031		2250	2610	2620	3260
0.0087		2150	2250	2750	2800